SEPTEMBER 1949

Plant Engineering

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Volume 3, No. 9

The magazine that helps plant engineers with their everyday problems

Easy oiling and chip clearance means better threads and longer die life.

BACK OFF OVER FINISHED THREADS?
Not the New BEAVER "77" POWER THREADER!

● Designed specifically for use with electric power drives, the Beaver "77" threader is an Opening Diehead with a range of 1/2 to 2-inch pipe or conduit and up to 1-1/2-inch bolts. Beaver "77" uses the same high-speed steel, heavy-duty dies as the Beaver Models A and B Pipe Machines.

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Dies are fully adjustable to cut standard, over-size or under-size threads, compensating for variations in pipe fittings. The dies are instantly interchangeable without tools. Nearly a hundred different kinds and sizes of dies are available for use in the Beaver "77."

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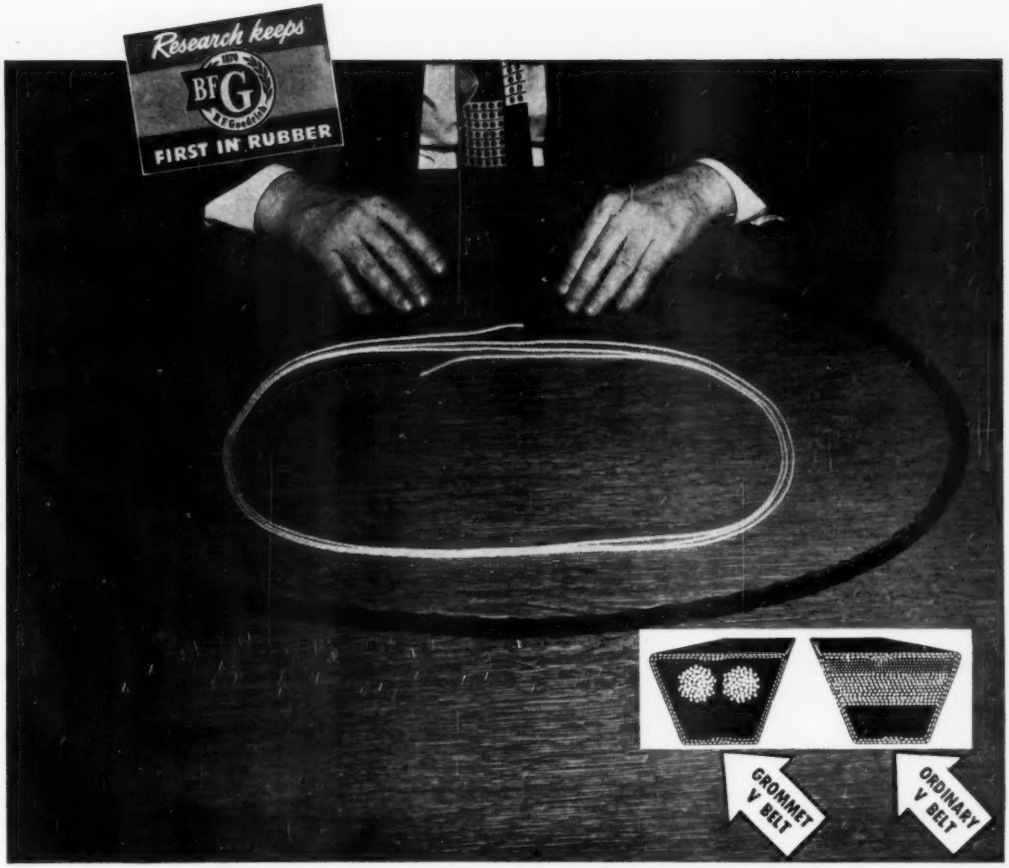

Endless grommet V belts end most cord failures

B. F. Goodrich grommet V belts cut costs 20 to 50%

THAT large loop of cord is a grommet, made by winding heavy cord on itself to form an endless loop. It is one of the twin grommets that make up the cord section of a B. F. Goodrich grommet V belt. The small loop, with the two ends showing, is one of the cords that make up the cord section of an ordinary V belt. Most of the failures in ordinary V belts occur in the region where cord ends overlap. Because the cord in a grommet V belt is in effect endless, such failures are eliminated.

Longer life—Elimination of overlapping cord ends, helps grommet V belts last 20 to 50% longer than ordinary V belts. *Concentrated* cord strength is another reason—all the cord in a B. F. Goodrich grommet V belt is in the twin grommets, each of which is placed close to a driving face of the pulley. This insures maximum power delivery, even load distribution, full use of all cord strength.

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No other V belt is a grommet V belt! Twin grommet construction is an exclusive B. F. Goodrich feature—no other V belt has it. Grommet construction is protected by U. S. Patent No. 2,233,294. (Now available in D and E sizes only.) To make sure you get genuine grommet V belts, see your local B. F. Goodrich distributor. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Grommet V Belts BY
B.F.Goodrich

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CCA

'Round About with the Editors

Comments on "Checking Flywheel for Trueness"

IN OUR PLANT we do considerable work of the nature described in the article "Checking Engine Flywheel for Trueness," which appeared in the July issue of PLANT ENGINEERING. For the benefit of others who might not be as familiar with this work as is Mr. Pheil of Twin Disc Clutch Co., I would like to suggest that caution be exhibited whenever checking: 1. Flywheel housing face; 2. Surface to which drive ring or clutch plate is bolted.

Our experience has shown that rarely is the same reading indicated whenever these two surfaces are checked unless the crankshaft end-play is removed and before observing the reading after the flywheel has been rotated.

Crankshaft end-play varies with different makes of engines, but many engines in the 100 to 150 hp range will have a normal end-play of 0.010 to 0.015 in.

I think Mr. Pheil's illustrations and instructions were well presented with the sole exception noted. *H. L. McCormack, Service Manager, Patten Tractor & Equipment Co., Bellwood, Ill.*

Missing Engineers' Department

IN THE JUNE and July issues of PLANT ENGINEERING you carried articles dealing with a Preventive Maintenance Program for Electric Drives by Marion A. Jensen. These I enjoyed for Mr. Jensen was my first plant and chief engineer.

When I first went to work for Mr. Jensen I knew little of the intricacies of plant engineering. Through his efforts, his inspiration and the "We can do it" spirit he instilled in me, I now have my license (Ohio).

Would you please be kind enough to forward his address to me? Through the years I have lost track of him and would like very much to contact him. *E. Ray Williams, Springfield, O.*

EDITOR'S NOTE: It is a pleasure to comply with Mr. Williams' request, and, for others who may wish to get in touch with him. Marion A. Jensen's address is 3236 Dudley St., Lincoln 3, Nebr.

From Our Friend and Plant Engineers Overseas

MR. OUGH has only just arrived back in this country from his extensive American tour, but he has already told me about his happy meeting with you, and I have written to Mr. Fava and to Mr. Hayden inviting them to get in touch with us when next they are on this side of the water.

Needless to say, such an invitation could not have been made without your good offices, and from what I have heard from Mr. Ough I am more anxious than ever to have the pleasure of meeting you one of these days. I should be more than pleased, therefore, to hear that when you come this way you will get in touch with us.

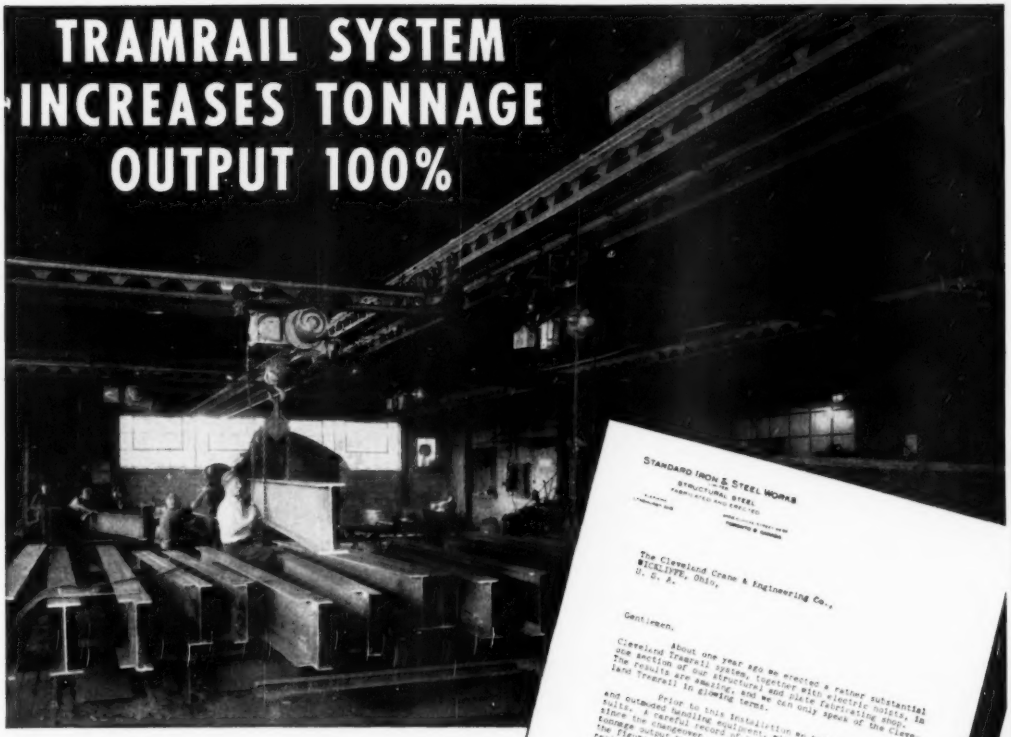
It is true that our Journal regularly gives you information of our activities but this is far from being a personal contact. Moreover I could perhaps show you something of the very heart of England, including Stratford-on-Avon which is quite near, and which I am contesting in the Liberal interest in the next election.

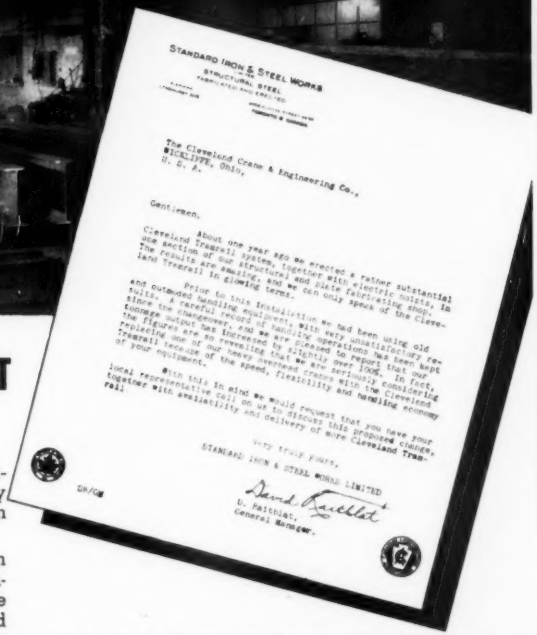
I look forward with interest every month to the receipt of your most interesting publication, which is then passed round to many equally interested engineers. We all think you are doing a very fine job of work. *Hadleigh S. Seaborne, Incorporated Plant Engineers, England.*

EDITOR'S NOTE: B. G. Ough of John Trelawny & Co. and a charter member of IPE recently spent several weeks in this country. A. A. Fava, Plant Engineer of Atlantic Gelatin, Woburn, Mass. and H. L. Hayden, Works Engineer of the Du Pont plant at Arlington, N. J., were contacted as representatives of the Plant Engineer Club (Boston) and the Plant Engineers Association (New York) respectively. The Journal referred is the bimonthly publication of the IPE.

IPE, the only national association for plant engineers, now has 1452 members including 102 overseas. Membership fees range from 1 guinea ($4.25) for junior members to 3 guineas for full members. Dues for overseas members are half the above rates. A booklet "What is Incorporated Plant Engineers" and membership applications are available. Write the Editor or write "IPE" on the postcard which is elsewhere in this issue.

TRAMRAIL SYSTEM INCREASES TONNAGE OUTPUT 100%





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STRUCTURAL STEEL
FABRICATED TO SPECIFICATIONS

The Cleveland Crane & Engineering Co.,
WICKLIFFE, Ohio,
U. S. A.

Gentlemen,

About one year ago we erected a rather substantial section of our structural steel, together with electric hoists, in the section Tramrail system. We can only speak of the Cleveland Tramrail in glowing terms.

Prior to this installation we had been using old and outmoded handling equipment, with very unsatisfactory results. A careful record of handling operations has been kept since the Cleveland Tramrail was installed and over these years the figures are conclusive that our tonnage output has increased by slightly more than 100%. In fact, replacing one of our heavy overhead cranes with the Cleveland Tramrail unit of the same capacity has increased the speed, flexibility and handling economy of your equipment.

With this in mind we would request that you have your local representative call on us to discuss this proposed change, together with availability and delivery of more Cleveland Tramrail.

Very truly yours,
STANDARD IRON & STEEL WORKS LIMITED
D. Kattlat,
General Manager.

DK/GM

STEEL FABRICATING PLANT AMAZED AT RESULTS

The tremendous way in which a Cleveland Tramrail system can cut costs has been convincingly proven to Standard Iron & Steel Works, a well known steel fabricator in Toronto, Ontario.

They replaced a standard I-beam crane system in a section of their plant with modern Cleveland Tramrail equipment. The easy, smooth operation of the new system and efficiency it introduced, enabled them to double their previous tonnage output. Their production costs were cut so drastically that the entire changeover in handling equipment was quickly written off.

The story of Standard Iron & Steel Works is typical of hundreds that could be told for industries of all kinds. Regardless of size or type, most Cleveland Tramrail installations pay for themselves in a few months—and they keep on paying handsome dividends year after year thereafter.

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BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

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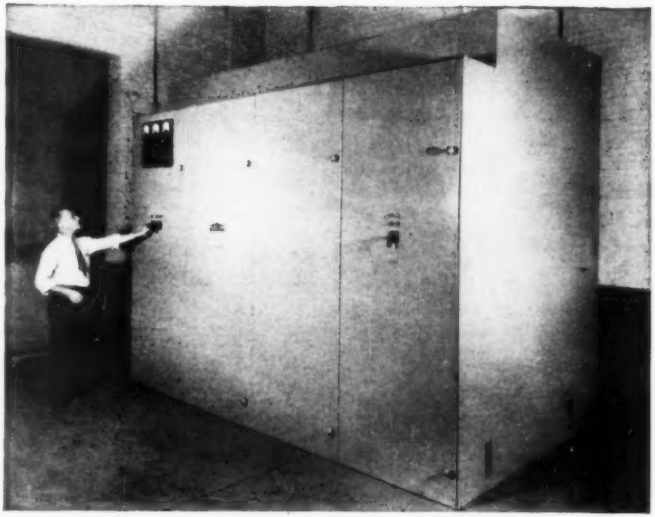
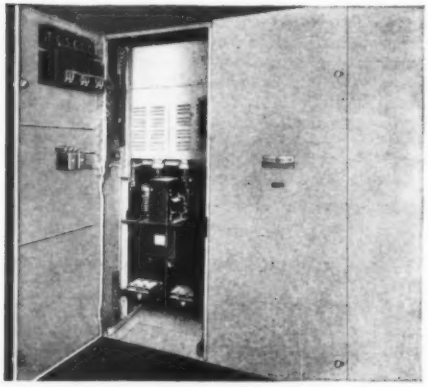


G. H. Slater, Plant Engineer of the Balmar Corp., inspects the General Electric 15-kv Type MI-6 metal-clad switchgear. Section lineup (left to right): Incoming line breaker, potential transformers, Power Co. metering, arc furnace feeder. Future plans call for two sections to be added to the right, one to the left, of the existing unit. Note neat appearance of metal-clad unit—it's space saving, too, and the metal-clad construction offers operating safety to personnel. And the three new sections will be added—when they are needed—with a minimum of fuss, bother, and expense.

Door of No. 1 compartment of metal-clad unit swung open showing magne-blast air circuit breaker (1200 amperes, 250,000 kva interrupting rating) in operating position. Magne-blast breakers are designed with adequate "IC" (Interrupting Capacity) for short circuit protection, are easily removed for inspection. Instruments and relays are co-ordinated for positive protection of high-voltage feeders.



OBSOLETE

OBSOLETE

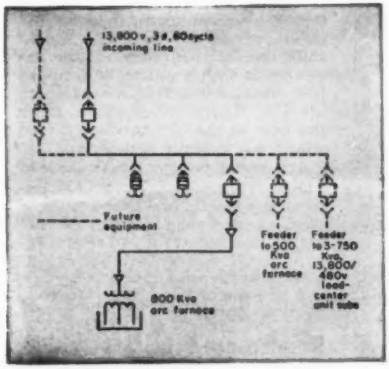
This old equipment was considered hazardous and deficient for present duties. Note dangerous, "spider-work" construction. Obsolete oil breakers of inadequate "IC" were seriously overloaded; in case of a bad short circuit could have exploded in a shower of flaming oil.

Metal-Clad Switchgear

—*here's why . . .*

"As a part of our long-range plan of replacing old 25-cycle with new 60-cycle equipment we wanted completely metal-enclosed units to help eliminate danger to operating personnel. Our figures proved it was more economical to purchase a complete unit rather than a 'knocked down' substation. The cost of installing this metal-clad unit was negligible."

G. H. SLATER, PLANT ENGINEER, BALMAR CORP.


13,800 v., 3 ø, 60 cycle incoming line
Future equipment
Feeder to 500 Kva arc furnace
Feeder to 3-750 Kva, 13,800/480v load-center unit subs
800 Kva arc furnace

Here's the one-line diagram showing the initial phase of changing over from 25 to 60 cycles at Balmar's Baltimore plant. General Electric 15-kv Type MI-6 metal-clad switchgear handles the incoming 13.8 kv through magne-blast air circuit breakers of 250,000 kva interrupting rating. Future plans call for another incoming line section, plus two more feeders.

The Balmar installation is a complete General Electric project—one source of responsibility, plus the very best in planning, engineering, manufacturing, and servicing facilities to give maximum savings and efficiency to the customer.

SEND FOR THESE HELPFUL BULLETINS

GEA-3083	Metal-clad Switchgear
GEA-4966	Low-voltage Metal-enclosed Switchgear
GEA-3592	Load-center Unit Substations
GEA-3758	Load-center Power Distribution
GEA-4507	Interlocked-armor Cable for Primary Circuits
GEA-4352	Flamenol Cable for Secondary Circuits

The Changeover at Balmar will continue over a period of years. This means only a small part of the total system capacity will be required during the early stages. A problem like this is easily solved with the General Electric load-center power distribution system that Balmar is using—it permits the installation of equipment as it is needed, and allows the over-all program to be accomplished in successive steps. This feature eliminates the necessity for tieing up large amounts of capital in equipment that would not be used to capacity for years to come.

The First Unit Installed was only large enough to handle its own load, plus a nominal margin for continuing the changeover program. As other units are added, this reserve becomes available for normal plant expansion and at no time will there be any large amount of unused capacity.

Modern Industrial Power distribution systems using G-E switchgear and load-center unit substations are applicable to any industrial plant or commercial building where you want full-voltage conditions for top performance of equipment, an extremely flexible setup to take care of expanding or changing loads, adequate short circuit protection, safety to personnel, and low installation and maintenance costs. A complete system, using G-E switchgear and load centers, costs you less than a "piece-meal," makeshift affair.

Investigate Today the many advantages of using General Electric switchgear and load-center unit substations in *your* plant for efficient, flexible power distribution. Contact your G-E sales representative for further information—and write for the helpful bulletins listed at the left. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

660-57

Plant Engineers' Digest

New Freeze-Concentration Process is Continuous

A NEW CONTINUOUS freeze-concentration process makes possible the highly efficient extraction of water from heat-sensitive solutions, particularly fruit juices, milk, coffee, beer, antibiotics, resins, etc.

The new method differs from conventional freeze-concentration processes in which the entire solution is converted into a mushy ice mass for treatment by draining, centrifuging or pressure. Perfected in 1948 by The Commonwealth Engineering Co. of Ohio the process is continuous as the solution overflows into succeeding troughs and out of the machine in concentrated form. The ice crystals originate in the most concentrated solution and are mechanically carried backward through the more dilute phases, where they can grow without danger of solids inclusion, than out of the machine at the point of liquid entry. *From Report on Operations, 1948, The Commonwealth Engineering Co. of Ohio, Cleveland, Ohio.*

Watch Out for Elevator Fires

ELEVATOR PITS, penthouses and shafts are places where fires are likely to start if cleanliness and maintenance are neglected. A recent study of 437 factory elevator fires over a 20-yr period suggests preventive measures. Twenty of the fires originated in pits, principally from carelessly tossed cigarettes. Pits should be kept clean, and not allowed to become catch-alls for rubbish and oil drippings.

Penthouses and elevator machine rooms, with their electrical equipment which sees severe service, usually unattended, represent real hazards, 340 of the 437 fires studied originating here. A motor without overcurrent protection ran single-phase, overheated, and caught fire. Sparks from a pitted motor brush ignited lint. Worn contactors at leveling selectors overheated and ignited. Frictional sparks from defective brakes ignited oil and grease. These instances show the importance of periodic and adequate maintenance.

Seventy-seven of the 437 fires occurred in elevator shafts, most of them caused by arcing at traveling control cables. Fire retardant outer coverings now generally in use largely eliminate this hazard. Most fires in elevator cabs start from arcing at electrical controls, which should be regularly inspected. *From Factory Mutual Record for July, 1949, a publication of Associated Factory Mutual Fire Insurance Companies, Boston, Mass.*

What is a Plant Engineer?

THE BRITISH answer to this interesting question is given in a definition which sets forth requirements for membership in the Institution of Incorporated Plant Engineers. It states: "Plant Engineers are those engaged in a supervisory manner on the maintenance or control of fixed or mobile plant."

Expanding this statement: the Institution accepts as members such "fixed" plant engineers as the chief engineers in charge of engineering plant in industry, in municipal and service establishments, together with their assistants or maintenance engineers; also such "mobile" plant engineers as the chief engineers and maintenance engineers in charge of contractors' plant. The fundamental rule is that all such men should be technicians holding executive positions of responsibility and not manual employment. *From Power Transmission for June, 1949, a publication of the Trade and Technical Press, Ltd., London, England.*

Don't Worry About New Thread Standards

WIDESPREAD publicity following adoption of unified screw thread standards by the United States, Canada and Britain, has aroused questions among plant engineers who use quantities of bolts, nuts, and other threaded fasteners in maintenance and repair work.

What is different? Fortunately for American engineers, the new unified standards conform to the American 60-deg thread angle rather than the British 55-deg angle. From the American standpoint, the principal change is increased tolerance in clearance between male and female threads, eliminating excessively tight fits during wrenching and seizure at high temperatures, and allowing room for plating.

Is fastener strength affected? Naturally the question arises as to relative strengths of old and new threads. The answer is that there is no change one way or the other. Bolts made to the old or new American standards are all equally strong fasteners.

Is fastener assembly affected? In all cases the new American standards can be assembled with the old American threads. This is fortunate, because the procurement of gages and tools and using up stock will take a relatively long time. Naturally, producers of fasteners will adopt the new tools needed for producing the new threads, as fast as the old tools wear out, but production of both types will go on for some time before conversion is complete. It should be remembered that the differences in dimensions are in most cases so minute that only with close gages in the hands of experienced men can the differences be shown.

Should the new standard be specified? Specify the new standard now with these reservations: Where the screw is to be assembled into a precision tapped hole and a wrench-tight stud fit is desired, the purchaser should state the fact definitely. If the assembly is with a nut or in a tapped hole where a free fit is desired, there are few, if any, cases where either the new or the old standard thread would not be fully satisfactory.

Are present fastener stocks obsolete? The answer is "No." It would be extremely wasteful and unnecessary to scrap present stocks. *From Fasteners, a publication of American Institute of Bolt, Nut and Rivet Manufacturers, Cleveland, Ohio.*

Nailing Down a Maintenance Problem

PIECE GOODS in the Webster, Mass. plant of Packard Mills, Inc., are thoroughly scrubbed before dyeing, and by the time this process is completed they are dripping with sulfuric acid. This company has long used wooden hand trucks to cart their fabrics from one processing point to another.

Keeping the trucks in serviceable condition was a continual chore for the maintenance staff, because the acid attacked the nails holding them together. Continual moisture tended

(Continued on page 10)

The countless gripping edges that are created when one of these Monel fastenings is driven into wood can be seen

THERE'S NO PLACE FOR THESE TROUBLEMAKERS • •

IN PLANTS THAT CAN MAKE A STATEMENT LIKE THIS • •

"We use your Streamlined '1000' Valves on the following equipment:

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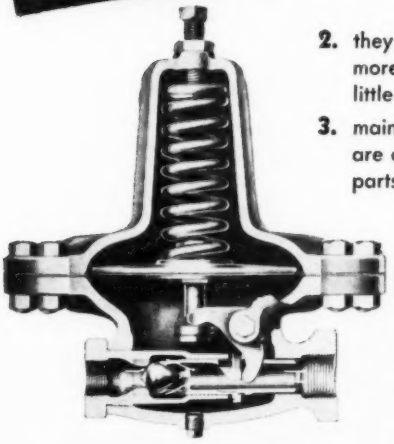
Plating Tanks
Degreasing Machines
Hot Water Heaters

CASH STANDARD Streamlined PRESSURE REDUCING VALVE TYPE 1000

"We use them:

1. because they hold close delivery pressure control.
2. they don't get gummed up, so we get more and better production with very little lost time.
3. maintenance cost is very low—the guts are cheap—old parts come out and new parts go in easily with little time lost."



ITS ASPIRATOR AND STREAMLINED FLOW WORK TO YOUR BENEFIT IN THESE 12 WAYS . . .

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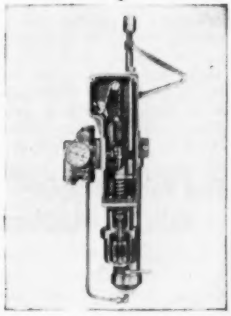
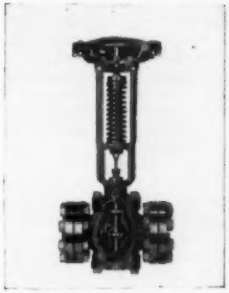


Bulletin 963 features the CASH STANDARD Type 100 Series of Super-Sensitive Controllers — various types for automatically operating valves, dampers, rheostats, stokers, pulverizers, fans, and other apparatus. 16 pages filled with descriptions and applications.



Bulletin 968 features the CASH STANDARD Type 34 Pressure Reducing Valve — direct operated — direct acting for handling steam, hot water, cold water, air, oil, brine—and most liquids and gases except some injurious chemicals. Illustrates and describes the different styles available and tells about their applications. Three pages of capacity charts.

Bulletin 956 features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.

to make these fastenings "back out." The hard treatment that such carts receive frequently resulted in loosened boards and sprung frames. When Packard maintenance men tried Monel "Anchorfast" nails they eliminated both problems at once.

The nails remained unaffected by the sulfuric acid drippings, and the annular grooves around their shanks made them hold like screws. It was also possible to eliminate the hole-drilling and setting compounds that screws would have required. They proved highly resistant to bending under the blows of the maintenance staff's hammers. *From Vol. XV, No. 3, of Nickelsworth, a publication of The International Nickel Co., 67 Wall St., New York 5, N. Y.*

Fast Paint Stripping —Walls and Machines

ONE OF THE West Coast plants of a leading nationwide bottler of soft drinks recently decided to do a little early spring cleaning, and as a starter plans were made to strip and repaint all the walls and equipment in their bottling room. Obviously, this necessitated halting the bottling operations for a while—so that speed was essential in order to get the plant back into production as quickly as possible.

Machines and other surfaces were wet down with a solution of Oakite Stripper M-3—a specially designed paint stripping product of an alkaline nature. About one pound of stripper to the gallon of water was flowed on to the surfaces by means of a solution lifting steam gun. After a brief soak, steam was turned up to 40 psi and, using a 4 oz. to the gal. solution of stripper all the machinery and walls were steam cleaned. This readily removed all old paint and rinsing with steam alone completed the job. *From Oakite News Service, a publication of Oakite Products, Inc., New York City.*

Heating Cables Keep No. 6. Oil Flowing

HERE'S HOW one company solved its pipe heating problem with heating cable. The fuel-storage tank of a machine-tool manufacturer is located above ground in such a manner that the fuel oil (No. 6) is gravity fed to the boiler-room burners through two 40-ft lengths of 2-in. pipe. Since 20 ft of each pipe line is above ground, some means had to be found to prevent the heavy oil from congealing in the lines during cold weather. Otherwise, periodic shutdowns of the heating system would be required to thaw the pipe lines.

This company has solved this problem easily, economically, and completely with two 120-ft lengths of heating cable. One length was wound spirally around each of the two pipes leading to and from the 15,000-gal storage tank for a distance of 20 ft—from the top of the tank to one foot underground. Each cable was formed in a hairpin, wrapped around the pipe at 6-in. intervals, and covered with asbestos insulation

Heating cable wrapped around each of the two pipes leading to this 15,000 gal storage tank keeps heavy fuel oil from congealing in cold weather

and a heavy coating of asphalt paint. Automatic thermostatic controls were installed to insure proper fuel-oil temperatures.

The outstanding efficiency of this installation was proven during a severe winter when no difficulty was experienced with the heavy oil congealing in the pipelines. *From No. 12 in General Electric Co's. series, "More Power to America."*

Here Is Your Stainless Office Building

THE COMPLETION of the world's first office building with a stainless steel exterior is headline news from G. E., in Schenectady.

The unique features of the building—a four story, 460 ft long office structure fronting the company's new $30 million turbine plant—may very well mark the beginning of a revolutionary new architectural trend in American building construction. The "curtain wall" panels used in the structure consist of fluted sheets of Allegheny Metal 18-8 on the outside and flat carbon steel sheets on the inside, sandwiching a core of fiber glass insulation. The 3-in.-thick panels are superior in thermal insulation value to a 12 in. masonry wall with furred plaster interior.

Curtain wall construction has been one of the bright new apples of the American architect's eye for several years now. Even the interested layman finds something exciting in simply hanging prefabricated panels on the structural skeleton.

In part, at least, the decision to use curtain wall panels for the turbine plant office building stemmed from the crying postwar need of the nation for more electric power and the turbines to produce it. As the quarter-mile-long plant's structural steel began lacing skyward last fall, General Electric decided to add additional floor space to the office structure to house additional engineers and draftsmen.

The project's general contractor, Stone and Webster Engineering Corp., determined that by using the comparatively light curtain wall panels, the extra space could be provided, adding a fourth floor without the necessity of strengthening the foundations already in place and steel already being fabricated. Substitution of other light weight material resulted in a reduction in dead weight in other locations, permitting the use of the existing steel and foundations for the balance of the structure.

Curtain wall panel construction looked like the ace of spades on this job for plenty of other good reasons, too. It offered the advantages of increased floor space, fast construction, elimination of cold weather construction problems and marked savings in maintenance and depreciation costs when corrosion resistant exterior surfaces are used.

The need for material elevators and extensive scaffolding was virtually eliminated, reducing nonproductive labor and fire hazard. Overall savings made it clear that curtain wall construction would actually be less expensive than standard masonry structure.

Stone & Webster and General Electric approved the plan immediately when it was learned that the H. H. Robertson Co., Pittsburgh, was in a position to both build the curtain wall panels and erect them.

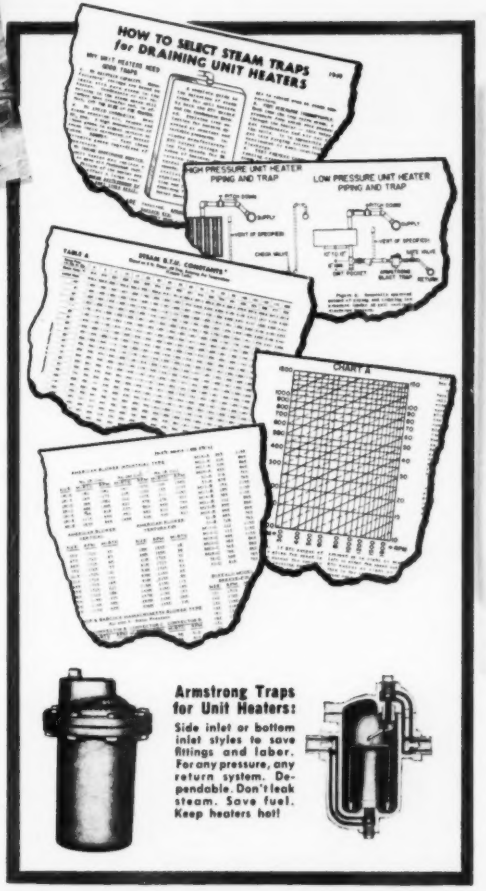
General Electric's acceptance of the new plans left only one major decision to be reached—the metal to be used for the exterior. After considering several materials, 18-8 stainless steel was decided upon.

Although stainless has been used for many years for pilaster panels, doors, spires and marquees, this new and more extensive use at General Electric presented a few problems that needed a little pioneering. Questions like these arose: "Would this large expanse of bright stainless be too dazzling? Could a series of panels be produced and erected with a sufficiently flat surface to avoid giving a wavy effect? Would the general appearance of a 'metal building' be too radical to eyes accustomed to masonry construction?"

(Continued on page 12)

HOW TO SELECT UNIT HEATER TRAPS

1. To obtain full BTU output
2. To insure continuous service
3. To avoid corrosion


HOW TO SELECT STEAM TRAPS for DRAINING UNIT HEATERS
HIGH PRESSURE UNIT HEATER PIPING AND TRAP
LOW PRESSURE UNIT HEATER PIPING AND TRAP
CHART B
Armstrong Traps for Unit Heaters:
Side inlet or bottom inlet styles to save fittings and labor. For any pressure, any return system. Dependable. Don't leak steam. Save fuel. Keep heaters hot!

THE ANSWERS are in a new 8-page handbook prepared by Armstrong! Only thing of its kind, this manual explains why it is important to use dependable traps that are properly sized and that will discharge condensate and corrosive incondensable gases at steam temperature; tells how to select traps by the BTU Method and the Condensate Weight Method; includes tables of BTU outputs of the heaters produced by 24 different manufacturers; discusses heater manufacturers' recommendations on types of traps to use and methods of installation; and includes tables and charts for working trap selection problems.

Anyone is welcome to a copy of this helpful guide to better unit heater performance. Address your request to:

ARMSTRONG MACHINE WORKS

912 Maple St., Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

Over a Million in Use... For Power... Process... Heating

Robertson and Allegheny Ludlum, producer of the stainless, anticipated these theoretical difficulties months ahead and conducted a series of tests with different finishes of stainless to overcome them. The completed building testifies that the fears of high reflectivity and lack of flatness and eye appeal were groundless.

The stainless steel selected, 18-8 with a No. 2B finish, was 20 gauge (0.0373 in. thick), as compared with the thicker 18 ga. carbon steel normally employed in such panels.

Erection of the stainless steel curtain wall sections presented no greater difficulty than the erection of similar panels made of other materials. Removal of the protective paper on the stainless revealed lustrous sheets, unmarked by rolling or handling or scratches. And if the gleaming metal on this first stainless office building in the world lives up to all past architectural performances, there's every reason to believe that the bright new building along the Mohawk will be just as bright and beautiful a hundred years from now as it is today. *From Vol. II, No. 3, Steel Horizons, a publication of Allegheny Ludlum Steel Corp., Pittsburgh, Pa.*

Extruded Nylon Strip in Commercial Production

EXTRUDED NYLON strip up to 2 in. in width and in thicknesses ranging from 0.020 to 0.100 in. is now being manufactured in commercial quantities at the Union, N. J., plant of Elastic Stop Nut Corp. of America.

Because of its resistance to abrasion and its self-lubricated, low-friction surface, nylon strip promises to find wide usefulness in such applications as inter-leaving of automobile springs, and as a bearing surface for guide rails and skidways, or in other places where lubrication might contaminate the product.

With good electrical properties, non-inflammability, and resistance to all common organic solvents, nylon strip, according to the manufacturer, machines readily. Tensile strength is rated at 9,000 to 10,500 psi, while its heat distortion temperature is 400 deg with 66-psi load. *From a bulletin of Technical News Service, a publication of G. M. Basford Co., New York, N. Y.*

Use Air Tanks Safety

EXPLOSIONS resulting from the effects of corrosion, together with combustion explosions, constitute the greatest hazards in the operation of compressed air systems.

The three most important factors to consider in order to insure safety in the use of air tanks are: 1. Use only tanks that are properly constructed by a reliable manufacturer; 2. Every effort must be made to see that the tanks are properly installed, that they are equipped with the essential pressure relief and control devices; 3. They must be well maintained. Tanks may become seriously deteriorated internally and dangerous to life and property and still exhibit no change in their outward appearance.

Corrosion may be detected through judicious handling of a test hammer and by observation. The several construction codes require that air tanks be equipped with inspection openings.

Compression of air is attended with a rise in temperature which is dependent primarily on the ratio of compression. It is not so much a question of the magnitude of the initial and final pressures as it is the ratio between them. Regardless of what the normal temperature at the discharge valves may be, the increase in temperature during compression is aggravated if the valves leak.

Such a circumstance permits each compression stroke to be started with the air at a higher temperature than existed at the start of the preceding stroke. This is because some of the heated discharge air leaks back into the cylinder on the suction stroke. Repeated action of this kind will result in a cumulative increase of temperature that may eventually lead to spontaneous combustion. Combustion explosions in compressed air systems can be kept at a minimum by observing the following precautions:

1. Use the proper quality of oil in an amount no greater than necessary to obtain satisfactory lubrication.

2. Arrange and locate the air intake so that the air is clean.

3. Make periodic examinations of the discharge valves to see that they are clean, free from deposits and that they seat tightly.

4. Periodically wash out compressed air systems with a lye solution to remove all oily deposits. Never use a flammable solvent.

5. Provide an adequate supply of cooling water of proper quality—*From the October 1948 issue of The Locomotive, a publication of The Hartford Steam Boiler Inspection and Insurance Co., Hartford, Conn.*

Luminescence for Plant Safety

PLANT SAFETY may be augmented in several ways through the use of phosphorescent or fluorescent pigments. The former emits light only after having been first excited or "charged" with a visible light source such as daylight or artificial-light of sufficient intensity. The latter type of pigment emits light only when continuously exposed to ultraviolet or "black light."

Two practical uses of such pigments are demonstrated in the accompanying photographs. The exit door might have been more effectively marked if the sidewalls had also been painted with stripes of luminescent paint. This would have given a dimension to the pathway and would permit speedier evacuation of occupants in case of an emergency. *From Paint Progress, a publication of The New Jersey Zinc Co., New York, N. Y.*

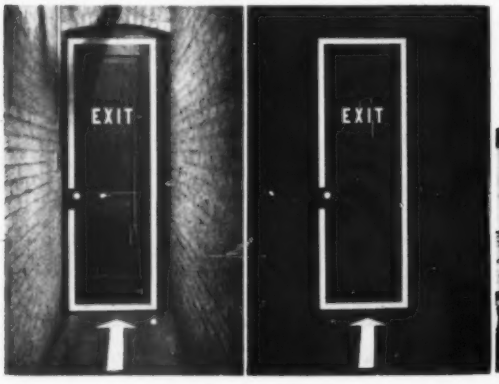
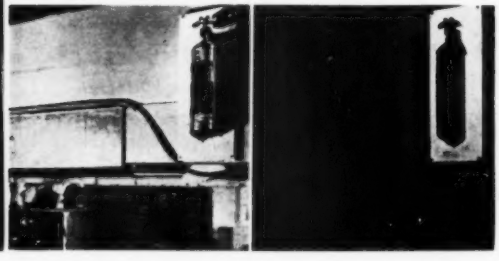
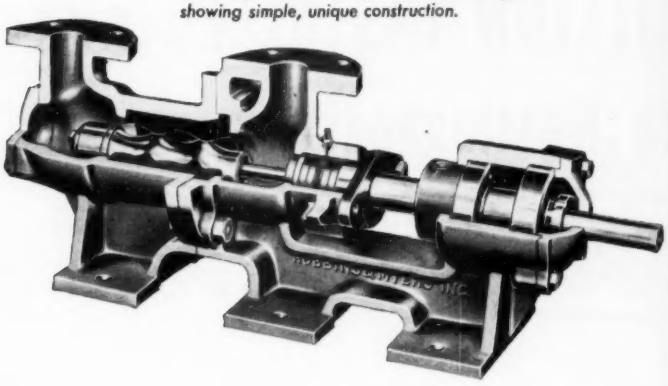


Fig. 1. Left: This exit door is quickly located in the dark in an emergency. The outline of the door is marked with phosphorescent tape and the doorknob and signs are painted

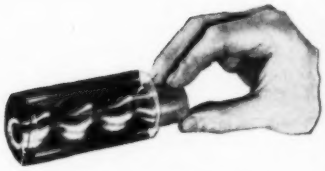
Fig. 2. Below: This fire extinguisher stands out in the dark against a glowing phosphorescent panel. It is located where the pigment will be "charged" by exposure to light



Cut-away of Standard R & M Moyno Pump; showing simple, unique construction.



SOLVE THAT PUMPING PROBLEM WITH A MOYNO



ONLY ONE MOVING PART

Moynos have no pistons, valves, or high speed impellers—no troublesome end seals—no noisy gears. Only a single-helical rotor turning inside a double-helical stator. This action creates "progressing cavities" that handle the material; forms continuous, *ever-changing* seal lines that prevent concentrated wear. Particles and solids in suspension are swept along without "churning." Rotor and stator are made from materials best suited to the need. No other pump is like the Moyno—*it keeps things moving.*

R & M MOYNO® PROGRESSING-CAVITY PUMP

Time after time, plant engineers have found the answer to their pumping problems in the R & M Moyno "Progressing-Cavity" pump. And no wonder—for here's a unique pumping principle that has no type limitations. Moynos pump virtually *everything* from volatile liquids to non-pourable pastes . . . and *keep on pumping when others fail.*

LONG LASTING—EASY TO MAINTAIN

In hundreds of plants, Moyno "progressing cavities" are regularly handling chemicals, foods, abrasives—many materials that were formerly "un-pumpable." Moynos self-prime, reverse; have low internal turbulence; deliver positive, *non-pulsating* discharge at pressures to 1000 p.s.i. They're *non-contaminating,* with bearings *outside* the pumping compartment. And the entire pump can be torn down, cleaned, and reassembled easily, and with ordinary tools.

Free Book tells how . . .

Available in types and sizes for all needs, Moynos are fully backed by Robbins & Myers' more than fifty years' experience in serving industry. Ask for free Book No. P-22E; it explains "progressing-cavity" pumping, gives capacities, dimensions, uses. Get this guide to better pumping, greater savings—*now.* Write for *your* copy today.

ROBBINS & MYERS · INC. MOYNO PUMP DIVISION
Springfield 99, Ohio • Brantford, Ontario

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OVER A MILLION INSTALLED KVA

in Westinghouse

Dry-Type Power Centers

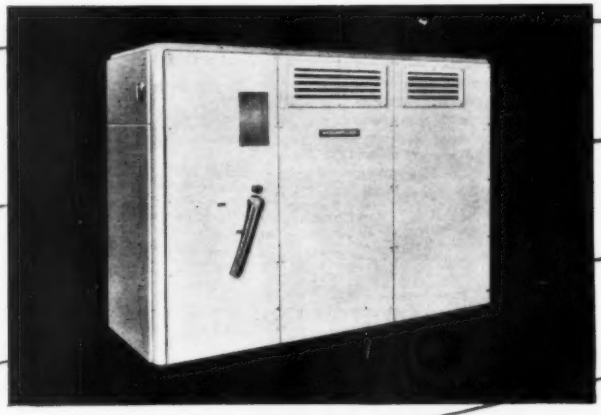
"A million installed kva" in itself is not important. What is important is that these modern Dry-Type Power Centers are doing an efficient job . . . a job of meeting today's production problems by providing *dependable* and *economical* distribution of power.

They combine the necessary high-voltage switching equipment, a dry-type transformer, low-voltage switchgear and the necessary auxiliaries into a compact, completely enclosed and fully co-ordinated unit.

Their "Unitized" design permits the addition of feeders as required by changes in the load. They can be installed quickly and at low cost . . . *near the load center.* This reduces losses and improves voltage regulation. Long runs of costly copper are eliminated. Add to this the other advantages of Dry-Type Power Centers . . . fire and explosion-proof . . . no vaults required . . . lighter weight. These are the reasons it will pay you to investigate modern Dry-Type Power Centers for your distribution systems.

Modern Westinghouse Dry-Type Power Centers can be supplied for use in any distribution system whether radial or network . . . where the high voltage is 15 kv and below. CONSULT WESTINGHOUSE. Call your nearest Westinghouse office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-97135



Indoor Dry-Type Power Center with primary switch and built-in panelboard.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

What is YOUR power distribution problem?

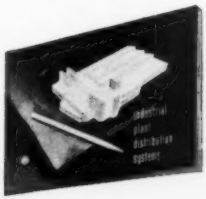
The importance of a power distribution system in an industrial plant makes it almost imperative that the *best system* be selected and included in the very basic planning for expansion or new building.

The problems of power distribution vary greatly from plant to plant. Meeting these problems for widely diversified industries has given Westinghouse an intimate knowledge of fields that undoubtedly closely touch *your* problem. Westinghouse offers complete cooperation to all industries in searching out better answers to all phases of the distribution and application of power.

★ ★ ★

Write for the new booklet "Industrial Plant Distribution Systems"

If you're considering expanding or building a plant, you'll find this booklet invaluable in choosing a distribution system that best meets *your* requirements. Ask for B-4045.



A Dry-Type Secondary-Network Power Center installed in a large mid-western industrial plant. Note it is located in the immediate load area which it serves.

MODERN EQUIPMENT FOR MODERN DISTRIBUTION SYSTEMS

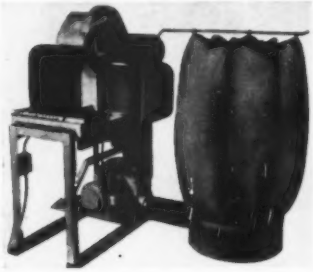
New Products and Methods

WHAT'S NEW? On these pages the Editors summarize the outstanding industrial developments of leading manufacturers who will supply you, free of charge, the bulletins or other information desired. For ease in making requests use the no-obligation, postage-paid card between pages 36-37 and 44-45

1—MASONRY SAW

For dry cutting, has "built-in" dust collecting vacuum

Described as the only dry cutting masonry saw with "built-in" dust control, the Fireproofer Model ADF has a powerful vacuum designed to collect dust and filter it through a filtering bag. Another feature emphasized for this saw is its adjustable cutting table. To accommodate material of



varying thicknesses operator simply lifts table which automatically locks in place.

Saw takes blades up to 14 in. dia. All working parts of blade assembly function as single unit. Welded all-steel unit construction. Saw is portable and easily moved—an average doorway is said to provide ample clearance. Both vacuum and cutting blade are powered by individual $1\frac{1}{2}$ hp motors operated by single synchronized switch. Martin Fireproofing Corp.

2—PAINT BY ROLLER

That applies flat-oil, water and plastic paints to all surfaces

Paint is fed to the roller head of the "400" Roller through a hose attached to a 3-gal paint pot with built-in pressure system. Rate of feed is controlled by a valve in the handle, operated by finger-tip pressure. No painting experience is needed to operate this unit, it is said, no paint is wasted, and there's no spatter to clean up.

Cover is of lamb's wool, used to provide a resilient surface for reaching into rough plaster, stucco and brick, and for giving a satin finish on smooth surfaces. Complete outfit includes roller head, tank with pressure-system using a 2-in. brass pump, pressure gage and air release valve, 18 ft of Neoprene hose, cleaning unit and two extra roller covers. List price is $69.50 but roller head assembly may be bought separately. The James Warren Co.

3—CONTROL VALVE

For erosive, corrosive and viscous fluids carrying solids

In the Domotor Control Valve the body is comprised of two simple castings bolted together with seat ring serving as a bridge or separation unit. Thus, clean, smooth flow passages are said to contribute to increased flow capacity. The two body parts may be rotated about the seat ring in assembly to form a right hand angle, left hand angle, or straight-through pattern. The addition of a simple straight adapter makes it a conventional angle pattern valve body.

Valve has threadless assembly. Replacement of seat and plug stem assembly can be done on the job without special tools. Piston-type actuating unit is said to provide exceptional stabilizing factor. An integral valve positioner unit is incorporated in piston actuated assembly housed within dome of the power unit, its only connection with moving mechanism is by frictionless spring.

Design of valve body and power unit are said to afford reduced maintenance, simplicity of parts interchangeability and replacement, and weight saving. Available in many alloys corrosion resistant trims and hard facings. The Annin Co.

4—WELDERS' GOGGLE

Is designed to be non-inflammable, moisture and heat resistant

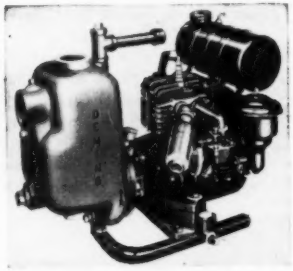
This new goggle is compression molded of durable phenolic compound. It features an indirect ventilated louver side shield and individually molded, non-reflecting eyecups. The eyecups have larger, rounded, face-contacting edges and will withstand considerable impact. Other features include wide angle vision, a chain bridge enclosed in a form-fit plastic covered tube, large

lens rings, one-piece rubber headband and improved over-all style and appearance. The goggle is fitted with 50 mm. round Noviweld lenses in several shades; and Noviweld Didymium lenses. American Optical Co.

5—PUMPING UNIT

Gasoline engine powered centrifugal is portable and self-priming

Designed for a wide variety of uses where electric power or belting facilities are not available, this new centrifugal pump is equipped with a $1\frac{1}{2}$ hp, four-cycle, air-cooled gasoline engine having a high tension magneto.



Pump has cast iron casing, bronze impeller mounted directly on engine shaft with a mechanical type shaft seal provided to eliminate need for stuffing box and packing gland. Pipe connections are $1\frac{1}{2}$ in. suction and $1\frac{1}{2}$ in. discharge; length 20 in., width 13 in., and height 19 in. Net weight 83 lb. Performance ratings range from 10 gpm with 80 ft head to 90 gpm with 15 ft head. The Deming Co.

6—CIRCULATOR UNITS

Are built to provide better heat transfer, lower steam costs

The Matco High Heat Pressure Pump Circulator Units are designed to return high temperature condensate to the boiler, to maintain a maximum pressure drop between the steam inlet and condensate outlet on the processing unit, and to deaerate this condensate before it is discharged into the boiler return line. Special features claimed for the units include jet drainage at the water level for constant elimination of air, and the elimination of flash steam losses. Standard units have capacities of 500 to 18,000 lb of condensate per hour; special units handle up to 50,000 lb per hour. Matco, Inc.

7—PIPE MACHINE

Is portable unit for cutting, reaming and threading

This machine cuts, reams and threads pipes to 2 in. dia and threads solid rounds to $1\frac{1}{2}$ in. dia. It is possible to rapidly chuck and unchuck work as spindle rotates, according to manufacturer, by means of a wrenchless chuck which centers work quickly and holds it rigidly. May be used for right or left hand rotation. Pipe of $\frac{1}{8}$ to 2 in. dia and bolts $\frac{3}{8}$ to

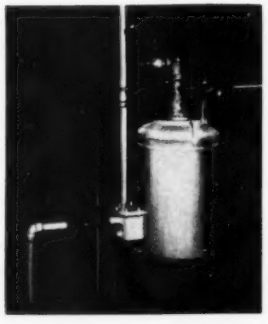
8—LIQUID TRANSFER PUMP

Operates by means of compressed air from 30 to 50 psi

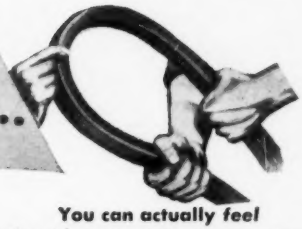
The new Ejectopump handles without aeration liquids of varying character and viscosity at temperatures up to 120F and higher depending on lift. Pump has maximum suction lift of 25 ft, and discharge heads up to 55 ft.

Liquid handled by the Ejectopump is not violently agitated or stirred, it is said, and with this pump no lubrication is required. It is also pointed out that gritty and corrosive matter can be pumped without damage to equipment and by use of suction and discharge valves, even suspended or included solids can be pumped. Pump is self-priming and includes an arrangement for blowing down the whole apparatus.

Operation is pneumatic and automatic. An air-operated ejector in pump head creates a vacuum throughout the pump and draws liquid in to the case. Schutte and Koerting Co.



Here is Plain PROOF...



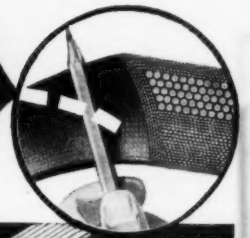
You can actually *feel* the sides of a belt *change shape* as the belt bends.

That the

CONCAVE SIDE

(U. S. Patent No. 1813698)

SAVES Transmission DOLLARS



When a *straight-sided* V-Belt bends around a pulley, three things are bound to happen.

(1) The top of the belt, being under tension, *narrows.* (2) The body of the belt, under compression, *widens.* (3) The sides of the belt *bulge out.*

These *shape changes* are inevitable. They are shown in figures 1 and 1-A, below.

Straight-Sided V-Belt.

How Straight-Sided V-Belt Bulges in Sheave-Groove.

Because this bulging belt does not fit the sheave groove, two facts become clear. (1) The belt will get excessive wear where it bulges—*shorter life!* (2) The whole side of the belt cannot *uniformly* grip the pulley—*a loss in drive efficiency.*

How different the V-Belt with the precisely engineered *concave* side (U.S. Patent No. 1813698)—the Gates Vulco Rope. As this belt bends it assumes a shape that *exactly* fits the sheave groove. (Figures 2 and 2-A, below.)

Gates Vulco Rope with Concave Side.

No Side Bulge. Precise Fit In Sheave-Groove.

Two savings result. (1) The Gates Vulco Rope wears evenly—*longer life!* It's entire side-wall grips the pulley—no slip—*full delivery of power!*

The Mark of SPECIALIZED Research

The Concave Side is MORE IMPORTANT NOW Than Ever Before

Because the sides of a V-Belt are what actually drive the pulley it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley directly through the belt's sidewalls.

Now that Gates *SPECIALIZED* Research has made available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side is naturally more important in conserving belt life today than ever before.

498

GATES VULCO ROPE DRIVES

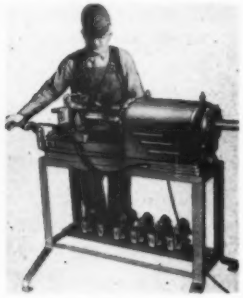
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U.S. and 71 Foreign Countries

THE GATES RUBBER COMPANY
DENVER, U.S.A.
"The World's Largest Makers of V-Belts"

New Products and Methods

$1\frac{1}{2}$ in. dia can be placed through rear centering unit. It is unnecessary to stop machine to reposition pipe, it is stated; after a thread is cut and die clamp head released, the pipe is removable by hand. Machine is intended for both new work and maintenance jobs.

Cutting speed is kept constant by a high



speed, universal geared-type motor with power curve that adjusts itself in speed to size pipe and type of thread being cut, manufacturer states. Adjusting screws are provided for cutting over- or under-sized threads. Both right and left hand chasers can be furnished and are adapted to standard die holders. Peerless Machine Co.

9—OVERHEAD CONVEYOR

Is small and low priced, for handling light work

The Webb "Junior" Conveyor, using 2 in. pitch chain travels on a 3-in. I-beam held by bolted brackets attached either to the supporting angles or tierods. Entire structure is light and can be hung from average ceiling, and the bolted hanger assembly can be installed by usual plant crew.

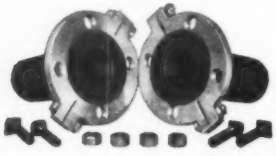
Chain may be assembled or disassembled without tools. The 2-in. pitch permits placing loads at intervals of 2 in. or more, depending on clearance required by loads. Load carrying hooks and carriers come in variety of types.

The Junior can be arranged to tie together operations of a whole plant including several floors, carrying parts through assembly, processing. Loops can be arranged for drying or for cooling. Horizontal curves as short as 9 in. radius are provided to make possible close spacing of loops in confined space. Vertical bends of small radius bring parts down to work level for processing up to ceiling level. Jervis B. Webb Co.

10—FLEXIBLE RUBBER PIPE

Is intended for conveying abrasive or corrosive material

Goodite flexible rubber pipe is made with manufacturer's Flang-Lok, and described as ideal for use in place of curved piping since the swiveling flange permits turning



to change the point of greatest wear and prolonging its life. Its capacity is said to exceed that of many pipes for severe service since the inside diameters are actual, affording a larger wearing area. Comes in sizes from 5 in. up and in lengths up to 50 ft, depending on diameter.

The Flang-Lock feature is built as an integral part of the hose and so constructed as to prevent fluid entering the carcass, according to manufacturer. The swiveling flange makes it easy to "fetch" up the bolt holes without turning the hose. Goodall Rubber Co.

11—LOAD VISUALIZER

Electric loads analyzed by small, lightweight 5 in 1 instrument

Besides serving as a standard 0-2.5/5/25/-50-amp ammeter and a 0-150/300/600-v voltmeter the Type AF-2 instrument can be used with a split-core or conventional instrument transformer to extend the range for determining watts, vars, volt-amperes and power factor. It can be applied in load surveys, induction motor tests, reactive power studies, and power factor checks in power and lighting circuits.

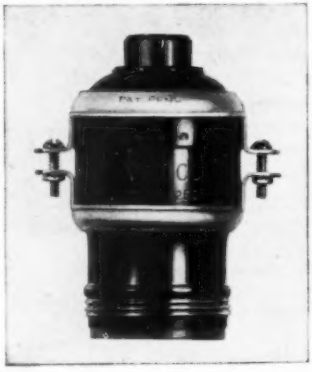
The load visualizer is self-contained to 50 amp; extensible to 1000 amp by split-core current transformer. A desirable hook-on feature enables surveys to be made without interrupting service or cutting conductors. All readings are made on one dial.

Housed in Textolite case with detachable carrying strap, the AF-2 measures $6\frac{1}{4}$ by 8 by 4 in. Furnished in kit form, including voltage leads, instruction cards, calculator and felt-lined carrying case. Instruments for higher ratings available. Frequency range is 50/60 cycles. Meter and Instrument Divs., General Electric Co.

12—SOCKET CLAMP

To eliminate breakage on all standard, medium base sockets

An extremely simple and inexpensive device, this new clamp consists of two identically formed rings of heavy gage steel. Assembly described as easy and quick. One ring fits over the socket cap,

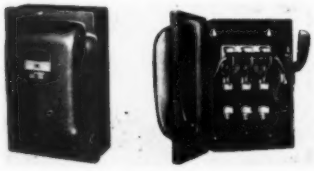


the other slides over the socket shell until it rests on the socket shoulder. Two machine screws clamp the rings together, to eliminate broken sockets. No special cap required for one size clamp fits all sockets. Streamlined and compact it is cadmium plated for long wear, corrosion-resistance. Retails for 25 ct. Vimco Mfg. Co., Inc.

13—SAFETY SWITCHES

In three types, are available in 30- and 60-amp sizes

These safety switches come in types for heavy duty industrial service, standard industrial service and general purpose service. A full cover interlock feature on the heavy-duty switch has an attachment that locks it on or off; this cover can be padlocked. Current carrying parts are silver plated, and blades are visible for quick



checking. Line terminals are dead front, protected by the hinged arc chamber cover. Quick make and break action is said to be assured by the simple mechanism, with no dead center.

A magnetic plate in arc chamber cover adds to an unusually high rupturing capacity, according to manufacturer, and jaws and fuse clips are steel reinforced. Non-tracking insulation is used in the base. The insulating cross bar is formed of melamine. Pressure connectors are removable, so solder lugs may be used. Other types are similar in appearance and dimensions, but have design and construction details to meet service demands. Square D Co.

14—CONTOUR CONTROL

Is developed to simplify making of irregularly shaped parts

This electronic instrument is designed to follow the lines of a drawing with an electric eye and guide a machine tool to cut out metal parts according to the drawing. Designated a "contour following system," the new device is connected to a machine tool called a "slave unit,"

so the machine's cutting tool reproduces in metal the drawing "seen" by the electric eye. As the "eye" moves along the lines of a drawing, the position of the cutting tool is changed accordingly by means of an electronic servo system, which emits signals to control the lead screws of the machine tool.

With the device, production of any shape can begin as soon as an accurate drawing is made, it is said. The equipment can follow a line in the form of a closed loop with a diameter as small as 0.06 in. It scans the line of a drawing through a low-power microscope at a speed of 0 to 6 in. per minute, not varying from the drawn line by more than 0.003 in.

A set of change gears provides a range of reduction ratio between drawing

WICKWIRE ROPE

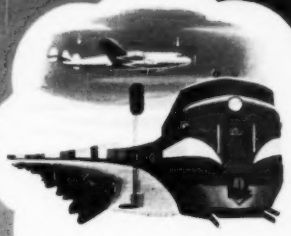
A PRODUCT OF CF&I

Ask any user . . . you'll find them everywhere

In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® Preformed. It lasts longer—is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant—Palmer, Mass.

IN THE EAST—Wickwire Spencer Steel Div. of C. F. &I.
500 Fifth Ave., New York 18, N. Y.
IN THE ROCKIES—The Colorado Fuel and Iron Corp.
Continental Oil Bldg., Denver, Colo.
ON THE WEST COAST—The California Wire Cloth Corp.
1060—19th Ave., Oakland 6, Cal.

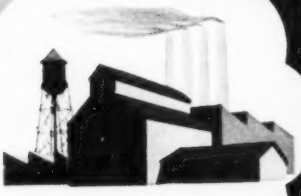
LOGGING



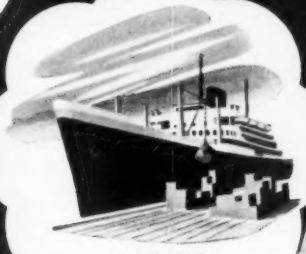
TRANSPORTATION

MINING

PETROLEUM



MANUFACTURING



MARINE

CONSTRUCTION

New Products and Methods

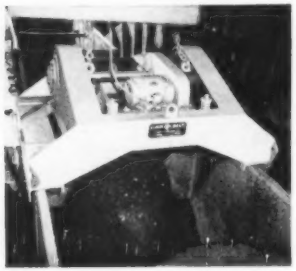
finished part from 3.75-1 to 60-1. The power required to operate the equipment is 220 v, 60 cy, approximately 20 amp. It will perform satisfactorily within an ambient temperature range from 65 to 104 F. Special Products Div., General Electric Co.

15—CAR SHAKER

Is self-contained vibrator unit for unloading gondola cars

The Link-Belt Car Shaker is designed for rapid, economical unloading of bulk granular materials from open-top, hopper bottom gondola cars to conventional track hoppers. It is recommended for unloading coal, sand, coke, ore, gravel and cinders, and for accelerating removal of damp materials frozen in cold weather.

Cars need not be uncoupled while shaker is in operation. Rotation of shaker's vi-



brator shaft at normal speed causes the vibrator-end of the shaker to rise and fall and impart heavy blows to the car. Usually located at the center of the car, the shaker imparts equal vibration to both ends. A feature is the low frequency of vibration for relatively quiet operation.

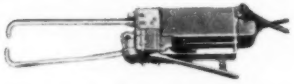
Normally 1 to 3 min operation of shaker is required to empty a car, and with proper spotting facilities 8 to 10 cars per hour may be unloaded. Shaker weighs 9700 lb and has a 20 hp motor wound for three-phase, 60 cycle, 220 or 440 v a-c. In installation in a conventional car unloading shed is described as simple. Link-Belt Co.

16—SPOT WELDER

Is portable, self-operating; for maintenance, manufacturing

Featuring several improvements over company's 1948 model, this welder weighs only 23 lb but is said to be sturdy enough for heavy duty industrial spot welding. Protected by a compact, non-corrosive cast aluminum housing, the unit is useful for on-the-spot welding jobs in hard to reach places.

Available in both 110 and 220 v models, 50-60 cycles, the tool welds up to $\frac{1}{8}$ in. combined thickness of metal including stainless steel and mild steel, as well as



two pieces of 18-gage galvanized. Protruding copper arms come in three interchangeable lengths—6, 12 and 18 in.—as well as in a variety of shapes and sizes. Durable replaceable special alloy tips are stocked for specific welding problems. Underwriters' Laboratories approved. Greyhound A.C. Arc Welder Corp.

18—PROTECTIVE SWITCH

For guarding hoists and cranes against accidental overloads

The Dyna-Switch slips onto the hoist or crane hook and load is lifted directly beneath it. The U-shaped tool steel bar of the switch opens and closes the circuit of a micro-switch as the loads are lifted. Normally the circuit of the switch is closed when loads are being lifted. If hoist capacity is exceeded, the circuit automatically opens, according to manufacturer, cutting out the motor and preventing the operator from making the lift. Circuit remains open until operator presses the switch to reverse. He must then remove the excess load before hoist will pick up.

Hoist motors up to $\frac{3}{4}$ hp can be handled directly through the Dyna-Switch; higher capacities are worked through an intermediate relay. Capacity of Dyna-Switch can be set to cut off any poundage between 500 and 10,000 lb; overload safety factor of flexing bar is given as 5000 lb, and breaking strength of eye-bolt as 29,000 lb. Overall length is 12 in. W. C. Dillon & Co., Inc.

19—TRANSFORMERS

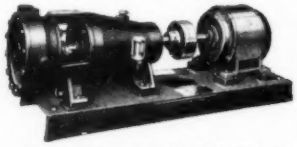
With two, rated-kva 5 per cent taps below rated primary voltage

Formerly a custom-built service on manufacturer's regular line, the newly developed tapped units will enable users to obtain 120/240 v output from undervoltage supply lines. With ratings from 1-50 kva inclusive, the new Type M and D dry-type transformers are designed for both 480-v and 600-v supply lines with series-multiple secondaries. They are particularly useful in lighting installations where some voltage adjustment may be necessary to maintain efficiency in light output. Specialty Transformer and Ballast Divs., General Electric Co.

20—CRADLE MOUNTED PUMPS

Come in capacities from 5 to 450 gpm in choice of materials

A new addition to manufacturer's line of Compacunit Pumps are these cradle mounted models which, unlike the regular

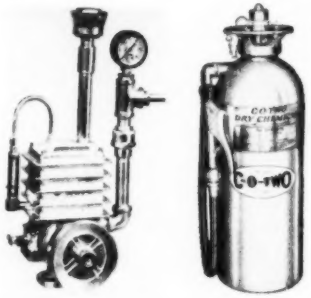


close coupled Compacunits, may be V-belt, turbine or motor driven. Available in sizes 1 in., $1\frac{1}{2}$ in., 2 in. and 3 in.; capacities 5 to 450 gpm, and heads 15 to 250. In standard all iron, all bronze or special metals for unusual requirements. Warren Steam Pump Co., Inc.

21—HIGH VACUUM PUMPS

For product processing lab work, testing and general use

These new units are reported to create up to 29.7 in. of mercury vacuum within 60 sec operation, with vacuum factor remaining constant at all temperatures. All units are oil-sealed and self-adjusting to compensate for wear. Design and mechanical features include: triple sealed open end; sealed-in-oil vanadium steel rotor shaft; self lubrication of moving parts; straddle mounted precision ball bearings. Now available in several models, all with fully automatic settings for 16 to 29.7 in. mercury vacuum. Said to be low in both initial cost and operation. Hetzel Brothers Co.



22—FIRE EXTINGUISHER

Is CO_2 dry chemical type, in 20- and 30-lb capacities

The C-O-Two Dry Chemical Type Fire Extinguisher is described as a quick-acting, self-contained unit in which the dry chemical is free flowing and the discharge hose and nozzle remain empty until the fire extinguisher is actuated. Approved by Underwriters' Laboratories, the dry chemical used is said to be non-conducting, non-corrosive, non-freezing and non-toxic, as well as highly effective on flammable liquid and electrical fires. The extinguisher is engineered for on-the-spot recharging; no special tools needed. C-O-Two Dry Chemical for recharging is sold in pre-measured 20- and 30-lb sizes; 50-lb bulk size. C-O-Two Fire Equipment Co.

23—GEARLESS PUMP UNITS

Are direct motor driven, close-coupled, supported by motor base

These pumps have $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ and $\frac{3}{4}$ in. ports. They are described as extremely versatile, giving excellent suction lift from simple circulation work up to heavy duty

17—ELECTRIC SANDER

Is low cost, portable unit built with high speed motor

The Century, an easily-handled sander, weighs only $4\frac{3}{4}$ lb and operates on the "orbital motion" action principle which is said to produce fine uniform sanding while enabling the operator to control amount of surface material to be removed. According to manufacturer, this permits sanding of parallel boards with opposing grain structures without risk of grit scars. Lightweight and compact (8 in. high), it is intended to reduce operator fatigue without sacrificing power necessary for use on wood, metal, composition and plastics.

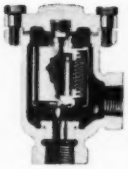
Because of its small size and low clearance it can sand up to corners and trim or under low obstacles and can be operated in an inverted position where necessary. Has streamlined, cast aluminum housing. As an economy feature standard size abrasive sheets cut in thirds are used; up to five sheets can be loaded on the pad at once. Motor is series wound, universal a-c, d-c type, described as non-stalling. Pad speed is 5000 rpm for fast sanding. Sterling Tool Products Co.

How to be Right the first time

WHEN SELECTING STEAM TRAPS

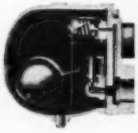
No single type of trap is suitable for all applications. But one of the four distinct Sarco types will be exactly right for any given application. Some provide quicker warm ups in the morning, some extract more of the heat, some are better for fluctuating condensate loads and others are better for out of doors. Sarco has the only plant devoted exclusively to complete lines of steam traps and temperature controls. To be sure, the first time, see Sarco first.

A THERMOSTATIC



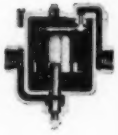
Wide open when cold for quick starts. Retains more of the heat before releasing condensate. Large valve orifice purges air quickly when starting. No seat changes when pressures change. Cannot freeze. Two types—for low pressure heating and high pressure industrial service up to 300 psi. Bulletin No. 250.

B FLOAT



Ball float allows continuous discharge without shock to temperature controls and other instruments. Automatic thermostatic by-pass takes care of air and gases without steam waste. All pressures up to 200 psi. Bulletin No. 450.

C BUCKET



Intermittent, but very rapid—can handle large volumes of condensate. Air goes out with the condensate. All parts attached to cover provide easy inspection. Straight-through connection makes installation easy. Integral strainer inside. Standard sizes to 250 psi. Forged steel types to 900 psi, and superheat. Bulletin No. 350.

D LIQUID EXPANSION

A low cost combination of trapping and approximate temperature control. Ideal for outdoor tanks and lines and other points where condensate cannot be returned. In other forms, used as combination trap and control for wash tanks, food equipment, etc. Catalog Nos. 250 and 550.

APPLICATION	1st CHOICE	2nd CHOICE
Process Tanks, small	A	C
Process Tanks, large	B	C
Dryers, Coil Type	B	A
Dryers, Fan Type	B	C
Drying Tumblers	B	A
Water Heaters	B	C
Preheaters, Fuel Oil	B	C
Rotating Cylinders	B	B
Slashers	B	B
Dry Cans	B	B
Flat Work Ironers	C	B
Presses, Laundry	C	A
Stocking Forms	C	A
Presses, Plastics	C	A
Presses, Platen	C	A
Evaporators	B	C
Steam Lines Outdoors, small	A	D

Ask for Bulletin No. 1600 "Selecting Steam Traps"

267

SARCO COMPANY, INC.

Represented in Principal Cities

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SARCO CANADA, LTD., TORONTO 5, ONTARIO

SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

New Products and Methods

against 150 lb pressure. Their electric motors are capacitor start, induction run in single phase models. Three-phase motors also available. Entire unit is resilient mounted and has automatic thermal overload relay.

The units are supplied in $\frac{1}{4}$, $\frac{1}{3}$ and $\frac{1}{2}$ hp models. The compact pump unit is made by means of a pump supporting bracket attached to the shaft and bell housing of the motor. Motor and pump shaft are in alignment and connected through a reinforced, flexible coupling. Eco Engineering Co.

24—CERAMIC PARTS

Of high strength aluminum oxide have wide industrial application

Resistance to heat, abrasion, and corrosion, and superior dielectric properties attributed to these ceramics make them excellent for mechanical parts of equipment where wear, friction or high temperature affect the durability of other materials. Parts shown include a main valve for steam pressure reducing valve, thimble

and sleeve for thermostatic mixing valve, governor valve plate in pump, nozzle for welding equipment, insulator for electric heat treating furnace, and turbine blade.

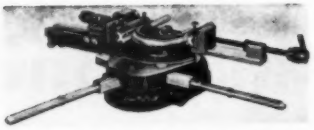
While custom made, costs are said to be comparable to or less than parts made of other materials in quantity production. The ceramic parts are made with extremely close tolerances, it is stated, and in fine finishes of various types for specific services. Physical properties vary according to the type, but all have a low coefficient of friction and the modulus of elasticity is described as greater than that of cast iron. Coors Div., Landes, Zachery and Peterson.

25—HAND BENDER

For general utility bending, takes tubing up to 3 in. diameter

The Model 848 has a capacity of $1\frac{1}{2}$ in. OD tube, and accommodates thin or heavy wall copper and aluminum alloy tubing, and light or medium gage annealed steel tube. The bender is operated by hand levers, actuating a central spindle and the attached radius block through gearing; ratios of 30-1 or 8-1 may be chosen.

Bends up to 180 deg may be made, including offset bends and U-bends in the middle of long tubes. Machine is reversible, and tube clamping and radius forming assemblies may be mounted on either



side; successive right- and left-hand bends can be made. Bend radius ranges from $1\frac{1}{8}$ to 12 in. Radius blocks, clamp blocks, slide blocks and mandrels are available for all standard sizes of tubing. Accessory equipment includes pneumatic mandrel extractors, side angle indicators, and special work tables and tool cabinets. The Parker Appliance Co.

27—SAFETY WHEEL CHOCK

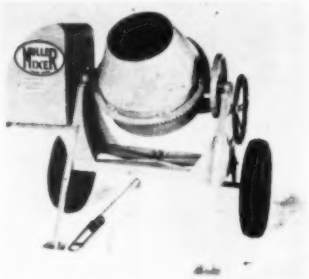
Is engineered to hold trailer securely against loading dock

Weighing $6\frac{1}{2}$ lb and measuring 8 in. high, this sturdy all-welded steel chock has been designed to prevent up-ending between loading docks and trailers. According to manufacturer, the chock's non-slip safety feature is achieved from its one-piece steel tread plate, formed to fit the radius of trailer tires, and an extended shoe on the back which prevents slipping on the pavement or ice and snow. Because it is all-steel, the edges cannot peel or chew away. Added safety precaution is achieved in painting the chock high-visibility yellow. Planet Corp.

28—CONCRETE MIXER

Is tilting, end discharge type, of $3\frac{1}{2}$ cu ft capacity

Designed for convenience and time saving, this unit provides for discharging directly into forms and for easy spotting on the job. Powered by a Briggs and Stratton air cooled gasoline engine with easy starting features, it is driven by a heavy roller chain on accurate cut tooth sprockets. Disc wheels are equipped with Timken



bearings and 5.50 by 16 tires. Two supporting legs provide a stabilizing four point suspension to prevent twisting strains. In towing, the large wheels and a 56 in. wheel tread are designed to permit high speed without danger of tipping. Muller Machinery Co., Inc.

29—PACKAGING ADHESIVES

For use in food industries, contain an insect repellent

Of great help to cereal, flour, confectionery and other manufacturers, troubled with insect infestation of packaged products, are these scientifically formulated and manufactured adhesives containing piperonyl butoxide, an insect repellent. According to manufacturer, the adhesives which comprise the Beetle-Pel group perform in the same manner as company's regular packaging adhesives.

Laboratory and field tests are reported to have shown that when suitable repellent stocks are bonded with the proper grade of Beetle-Pel, the attacks of confused or sawtooth (cadelle) beetles fail to penetrate the packaging. Beetle-Pel adhesives have been used to seal and wrap packages as well as to combine and laminate packaging materials. Cartons tight-wrapped with Beetle-Pel are said to be impervious to attacks of boring insects. National Adhesives Div., National Starch Products, Inc.

30—GEAR COUPLING

Is engineered for durability, strength, and easy installation

The simplicity and compactness of this coupling are credited to the use of fewer parts. It is made of forged high carbon steel, with internal teeth running the full working length for maximum strength.

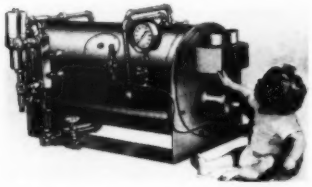
The sleeve may be removed in 7 min, according to manufacturer.

A snug fitting Neoprene seal is provided to keep oil from leaking out and dirt from entering. This seal is reinforced with a garter spring and is said to be resilient enough to maintain constant closure against slight depressions and unevenness of shaft surfaces. Hub teeth are cut radially to permit perfect alignment without excessive backlash in the teeth. Available in $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2 and $2\frac{1}{2}$ in. sizes; larger sizes can be ordered. Sier-Bath Gear & Pump Co.

31—MINIATURE BOILERS

Scotch marine type, they come in 3, 5, 7 and 10 hp capacities

Boilers in the Little Scotchman series are so small they can be placed under or behind other equipment. The 3 hp unit, when fully equipped, measures a little over 4 ft long, is 2 ft wide and less than 2 ft high. The larger capacity units are only a few inches larger in size and all models are designed to maintain 100 lb working pressure.

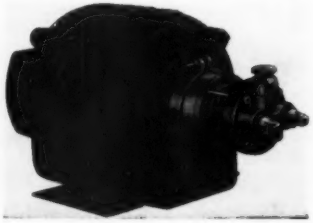


Of all steel construction, the fully lagged, steel jacketed boiler is delivered as a complete package, ready to hook up to fuel and water lines and operate. Built to burn either gas or oil. Steamaster Automatic Boiler Co.

32—WATER PUMP

Is high pressure, low cost, electrically operated unit

The Model RD-7250-A industrial water pumping unit is complete and ready to operate from ordinary house current, and

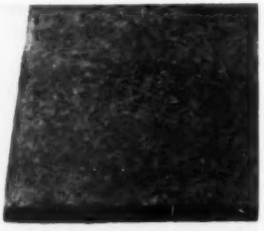


26—HARDWOOD FLOORING

Is laid with a trowel over any floor surface and dries quickly

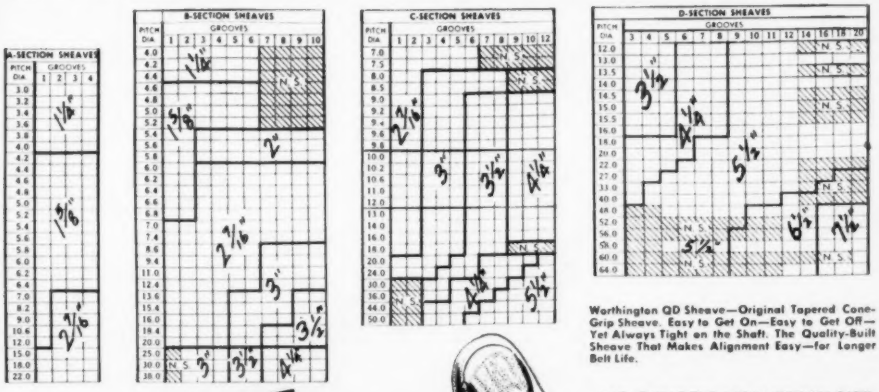
Roc-Wood is described as having the beauty of expensive cork floors. According to manufacturer, this flooring development makes use of the hardest kind of hardwood fibers, chemically treated and bonded together with plastic to create a practically indestructible flooring that is resistant to fire, rot, termites and rats.

Roc-Wood can be installed wherever flooring material can be laid, it is stated, even over concrete slab and rough uneven surfaces. Easily applied by anyone, the dry material is mixed with the Gel. Then the wet material is placed on the cleaned floor surface. Roc-Wood Floors, Inc.



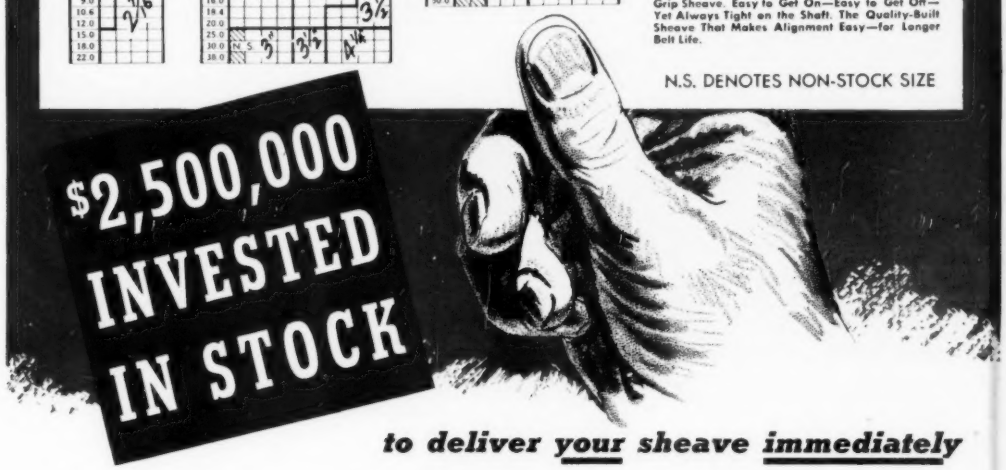
THE GOOD RIGHT HAND OF INDUSTRY

STOCK SIZES WORTHINGTON HEAVY DUTY "QD" SHEAVES WITH MAXIMUM BORES INDICATED



Worthington QD Sheave—Original Tapered Cone-Grip Sheave. Easy to Get On—Easy to Get Off—Yet Always Tight on the Shaft. The Quality-Built Sheave That Makes Alignment Easy—for Longer Belt Life.

N.S. DENOTES NON-STOCK SIZE



to deliver your sheave immediately

As long as it takes our distributor's shipment to get there is as long as it takes—in most cases—to get exactly the sheave you need into your hands. Your Worthington distributor has practically any stock size you'd ever call for—if he hasn't, one of the Worthington warehouses will get it to him in 24 hours or less.

Check your sheave requirements. With more sheaves listed as "stock sizes" and more sizes in stock than any other distributor, your Worthington distributor may be able to save you the cost of a special sheave.

Top-ranking distributors in every industrial center handle Worthington QD Sheaves and Worthington-Goodyear V-belts. They are backed by Worthington warehouses whose stocks duplicate the factory stock at Buffalo—more sizes stocked than any other sheave on the market. With 853 sizes in "A", "B", "C" and "D" sections, ½ to 600 hp, you can fill almost any rpm requirement with a *stock* sheave. Also: 332 listed stock sizes of EC Cord V-belts.

So, when you need sheaves, call your local Worthington Multi-V-Drive distributor—his name is under Worthington in A-Z Section of THOMAS' REGISTER.

For Balanced Drive Performance

Specify Worthington Multi-V-Drives, with QD Sheaves and Worthington-Goodyear EC Cord V-belts. (Goodyear EC Cord or Steel Cable V-belts are used exclusively in Worthington Multi-V Drives.)

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION
MULTI-V-DRIVE SALES DIVISION
Buffalo, New York—General Offices: Harrison, New Jersey

The Good Right Hand of Industry

POWER TRANSMISSION: sheaves, V-belts, variable speed drives
PUMPS: centrifugal, power, rotary, steam
AIR COMPRESSORS: water-cooled, air-cooled

MVB-2

New Products and Methods

may be used in many processes where a compact portable pump is required. Pump end may be disassembled and cleaned. Constructed of corrosion-resistant materials, the body is bronze, liner and rotor stainless steel; non-friction materials are used for blades and pump bearing. No lubrication is required other than the liquid pumped. All parts are interchangeable.

The motor is 115 v, 60 cycle, single phase, 1/6 hp, driving the pump directly at 1725 rpm. Pump has non-pulsating, positive displacement element of rotary vane type. The integral relief valve is adjustable to 80 psi outlet pressure. Balanced valve feature is designed to prevent deleterious effect of variable-pressure tap water on outlet pressure. Rated capacity at 50 psi outlet pressure is 45 gal per hr. Total weight is 25 lb. Romec Div., Lear, Inc.

33—HYDRAULIC DIE TABLE

Has roller top and winch, and can be elevated 8 in.

This table has a top 31 by 42 in. Thirteen rollers set on 3-in. centers extend slightly above the side channels so large, overhanging dies can be handled. A removable retaining bar prevents dies from rolling off the open end of the table. To pull dies from presses and storage racks, a 35 to 1 ratio hand winch is furnished with 15 ft of steel cable.

Table elevates from lowered position of 22 in. to elevated height of 30 in. Greater ranges can be furnished. A single speed foot pump enables operator to position dies weighing up to 2000 lb. Two 5-in. dia swivel casters and two 5-in. rigid casters provide for easy rolling, and a floor lock is provided to hold table in position. A die separating device is optional extra equipment. Lyon-Raymond Corp.

34—PANEL INSTRUMENTS

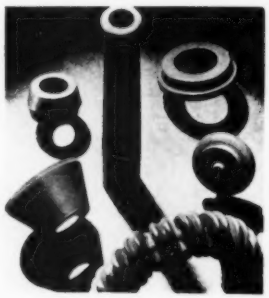
In 2½ in. size for use in electronic devices, testing equipment

This improved line of 2½ in. panel instruments for use in apparatus offering only limited mounting space is identified as Types DW-71 (direct current), DW-72 (thermocouple), DW-73 (rectifier), and AW-72 (iron-vane). The instruments fea-

ture stylized cases, tapered pointers and scales with large, easy-to-read numerals, and are available in square or round cases in preferred ratings. Housed in dustproof and moisture-resisting black molded Textolite cases, these instruments are described as accurate within ± 2 per cent. Meter and Instrument Divs., General Electric Co.

35—SILICONE NO. 250

Is available in molded, punched, extruded, and lathe-cut parts



No. 250 Silicone rubber stock is said to be fundamentally different from other Silicone rubbers and feature improvements in tensile strength, elongation, tear resistance, and dielectric properties. It is recommended for applications requiring good mechanical strength and resilience at temperatures below -50 F. and above 200 F. Parts fabricated from it are intended to give satisfactory service at temperatures below -100 F. and higher than 500 F.

Silicone No. 250 can be fabricated into washers, gaskets, sleeves, and tubing as well as molded shapes. It is orange-tan in color. Parts fabricated from Silicone No. 250 are described as resistant to ozone, tricresyl phosphate, and the chlorinated hydrocarbons used in liquid-cooled transformers. The Stalwart Rubber Co.

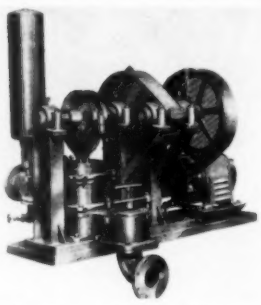
36—NEW PUMPS

Diaphragm and plunger types for heavy pumping requirements

Presented in this extensive new line are motor- and engine-driven diaphragm and walking-beam plunger pumps and eccentric drive plunger sludge pumps. They have many applications and, according to manufacturer, will pump liquids so heavy as to be nearly solids including viscous and clotted compounds, trash-laden liquids and thick residues. All the normal duty models are available with electric motors.

The sludge pumps are intended for removal of sludge from settling tank hoppers and the transfer of materials from digestion tanks to storage units and sludge beds. Their positive pulsating action is claimed valuable in cutting volume of sludge to be handled. These pumps are said to pass large quantities of bulky debris, not air-bind or gas-bind readily, and operate efficiently on suction lifts as high as 20 ft.

Eccentric drive plunger sludge pumps are included in the line. Type PE, shown, is powered by a standard horizontal motor,



V-belt transmission and reduction gearing. Also supplied with vari-drive motor for use where application requires varying capacities. In 4- and 6-in. sizes, capacities from 3000 to 14,000 gal per hr.

A feature said to enable all these pumps to remain virtually clog-proof is the large ball valves guided by tapered ribs in the valve chambers. Other advantages emphasized are their ability to handle heavy pumping for sustained periods, and pump either a slow seepage or full capacity with each stroke without adjustment or change of speed. Marlow Pumps.

37—POSITIVE GRIP WRENCH

Has multiple jaws, for holding pipes and solid rounds

Built to handle pipes and rounds up to 2 in. dia, the Link-Grip Wrench is made with seven hardened jaws, all of them in contact grip the work around its entire periphery. Pressure is equalized on each jaw to produce a steady torque for tightening or loosening. There is said to be no danger of marring pipe with this wrench, which has serrations milled in each link. Handle is used for leverage only, and as leverage is applied, each link in contact bites into the work surface.

Individual male and female links of this wrench pivot on hardened pins. The links move in either direction, making it possible to thread them behind close fitting pipes, it is stated. The wrench has a malleable cast iron handle and a link lock, held in a notch on the handle. Pins in this lock engage the handle notch and an open slot in one of four slotted links. Individual links are replaceable. Accord-

ing to manufacturer, all types of pipe fittings and unions can be handled with the wrench and it will stand unusual torque strain. Has chip resistant finish, baked chrome enamel on handle. American Machine Works, Inc.

38—WEATHERPROOF SWITCH

Is externally operated, designed for outdoor use

This new device was primarily designed for use on buildings requiring a 30 amp. capacity service entrance switch in combination with four plug fuse branch circuits. Two styles are available, R33NP4 with two main plug fuses and R33NU4 without provision for main fuses. Both have a 1 in. hub. A raintight cabinet is provided to protect the interior mechanism, so the switch has many applications for either temporary or permanent outside installations.

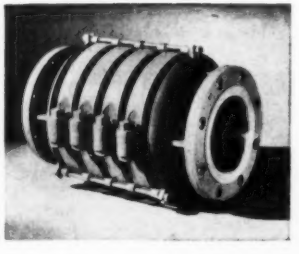
Access door for branch circuit lighting fuses provides dead front. The dead front cover is hinged at top and provided with means for holding the cover in the open position to facilitate wiring and replacement of main fuses. The spring catch front cover can be sealed. Adequate clearance is provided to accommodate branch fuses of the non-tamperable type and the spring catch on the panel door may also be sealed. General Switch Corp.

39—EXPANSION JOINT

Is suited for use in remote and hard-to-service locations

With the Adsco Corruflex Expansion Joint more economical installations are said to be possible since its compactness permits use in trenches, tunnels or other cramped quarters.

Corruflex is available in sizes from 3 to 24 in., single or multiple corrugation.



Corrugated white translucent PLEXIGLAS *covers the entire ceiling of the main lobby and elevator foyer in the Central National Bank, Cleveland, Ohio. Specifications, developed by the Buckeye Lighting Division of General Electric, called for 1100 sq. ft. of* PLEXIGLAS *#122-125, .125" thick.*

Man Without a Shadow

A man *can* lose his shadow—under a PLEXIGLAS luminous ceiling. Translucent sheets of this acrylic plastic, installed from wall to wall under fluorescent lights, diffuse illumination so completely that shadows are eliminated.

PLEXIGLAS luminous ceilings do more than eliminate shadows. They eliminate glare—both direct and *reflected*. They provide even illumination throughout a room, and insure a low brightness factor. In both performance and appearance, they are pleasing to the eye.

The economy of PLEXIGLAS luminous ceilings matches their efficiency. Better lighting with lower electrical input results from the maximum transmission and minimum absorption of light by white translucent PLEXIGLAS. Installation of the thin, light-weight, remarkably strong sheets is easy and inexpensive. Maintenance costs are negligible, and replacement of the non-discoloring material is unnecessary.

In banks, drafting rooms, stores, classrooms and control rooms, PLEXIGLAS luminous ceilings have already been installed and are meeting every requirement for truly efficient lighting. Write us about *your* lighting problem. We will be glad to tell you more about this new, highly successful means of large-area illumination.

Canadian Distributor:
Crystal Glass & Plastics, Ltd.
282 St. Helens Ave., Toronto, Ont.

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

New Products and Methods

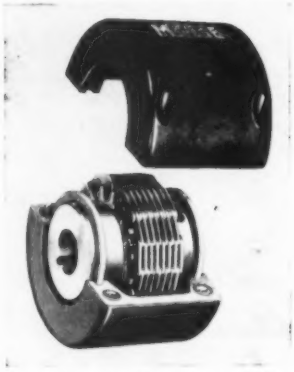
with or without self-equalizing rings, single or double units, and with either flanged or welding ends. Supplied in copper, stainless steel or other alloys, and with internal sleeves, if required.

The traverse of the Corruflex joint ranges from fractions of an inch to 15 in., and will operate under pressures from vacuum to 300 lb, and temperatures from sub-zero to 1600 F. American District Steam Co.

40—PLASTIC COVERS

Afford protection for chain couplings, are easily installed

These new covers are molded of rag-filled phenolic plastic for maximum strength with minimum weight. The plastic material used is highly resistant to practically all acids and alkalies and is

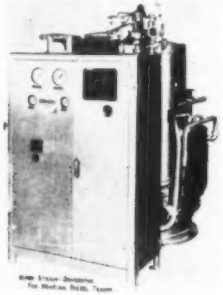


immune to rust. Covers are streamlined for safety, provide sealed-in lubrication and maximum protection. The two-piece construction with slot head screws, requires only a screwdriver for easy installation after the coupling has been completely installed. Morse Chain Co.

41—SMALL GENERATOR

Is designed to develop full working pressure in 2 min

Over 200 lb steam pressure within 2 min is reported possible with the Vapor Intensi-Fired Steam Generator Model OK-4625. In it hot gases from burning atomized Diesel oil, releasing 1,000,000 Btu per cu ft of fire box, sweep over the 500 ft of seamless



steel tube coils, developing 2500 (plus 20 per cent) lb of steam per hr, one electric motor, operates the fuel and water pump, blower and ignition system automatically to maintain desired working steam pressures between 75 and 250 lb. Overall size is 40 in. wide, 68 in. long and 73 in. high. Vapor Heating Corp.

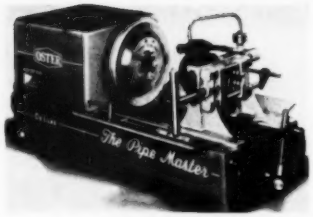
42—PIPE, BOLT THREADER

Is portable, intended for light socket connection

The No. 522 De Luxe Pipe Master, of aluminum construction, has a regular pipe range of $\frac{1}{4}$ to 2 in. pipe; extra range of $\frac{1}{8}$ in. pipe; extended range of $2\frac{1}{2}$ to 3 in. pipe when used with drive shaft and geared die-stock; and a bolt range of $\frac{1}{4}$ to $1\frac{1}{2}$ in. The machine is furnished with a universal geared head motor and safety switch.

Two stationary, quick-opening and adjustable die-heads are standard equipment. The front chuck, called the Spinfast, eliminates need for chuck wrench. Rear chuck is self-centering. A roller-type self-centering cut-off device requires no adjustment of the two rollers, and a cut-off gage is calibrated for easy setting for any length of nipple up to 6 in.

Machine is regularly furnished for bench use, but can be furnished on a steel stand



with 16 in. plain wheels or on a pipe leg stand with tool tray. Net weight, machine only, is about 229 lb. The Oster Mfg. Co.

(Continued on page 67)

Bulletins on Current Plant Problems

ELECTRICAL

101 Enclosed Motor Design—Form 1524, 8 pp. features the new developments in electric motor design incorporated in manufacturer's horizontal enclosed motor, available in ratings from $\frac{1}{4}$ to 250 hp. These design features are illustrated by natural color photographs and progressive drawings. Bulletin discusses the economy, safety and other advantages of the motor, describing the windings, housing, lubrication, castings, ventilation, rotor and laminations. Also explains temperature rise in motors and its effect on windings. U. S. Electrical Motors, Inc.

102 Bus Duct Economy—Four-pp Bulletin 180 stresses the economy of installing manufacturer's plug-in bus duct, in which new loads may be added later or present loads relocated with minimum delay or cost. Photo shows a section of the duct and sketches illustrate joining of sections, hangers, supports and channels. Includes large photo showing a typical installation. Federal Electric Products Co.

103 Mercury Plunger Relays—Bulletin 48 offers 4 pp of data on manufacturer's redesigned and improved line of mercury plunger relays. Describes these design features briefly, giving tube sizes, coil voltages. Illustrations include actual size photo of a unit, drawings showing operating principle of a normally open type, and dimensional drawings of four types. Ebert Engineering & Mfg. Co.

104 Oil Circuit Breakers—Bulletin 71B-6129D, 4 pp, describes oil circuit breakers for central station and industrial service where economy of operation and space are important factors. Photos of typical contact assemblies, tanks, and a cross section sketch of ruptor interrupting device are accompanied by a discussion of the construction features and operation of these circuit breakers. Includes table of ratings and reference chart of general dimensions. Allis-Chalmers Mfg. Co.

105 Manual Starters—Four-pp Circular TEC-317A describes and illustrates a thermostatic tumbler manual starter which provides overload protection for small motors up to 1 hp, emphasizing its heater. Circular contains many photos of starters and component parts, and recommends applications. Also includes dimensional data and suggested specifications for users. The Trumbull Electric Mfg. Co.

106 Wire for Hot Spots—Catalog 509, 34 pp, covers a line of wires and cables having asbestos or asbestos and varnished-cambric insulation, suitable for electrical installations where extreme heat, corrosive fumes and fire hazards are present. Equipment described includes 600-v cable for motor connections and electric furnace leads, control cable for boiler rooms and power stations, cable for hinges or jumper connections on swinging panels, and high voltage power cables. Catalog also describes and illustrates a line of 300-v cable for arc lamps and spot lights, stove wire, heat-resisting flexible cord and fixture wire, as well as 600-v switchboard wire. Specifications, sizes, weights given. National Electric Products Corp.

107 Selenium Rectifier Stacks—Six-pp Brochure C-349-848 features a line of selenium rectifiers for a-c to d-c conversion. Contains operating characteristics, applications, circuit diagrams and design data and price information on full wave, single phase and bridge rectifiers. Also features cross sectional view of a typical selenium rectifier stack and a description of a $6\frac{1}{4}$ by $7\frac{1}{4}$ in. selenium rectifier cell, said to be the largest commercially available in this country. Also covers manufacturer's standard line of rectifier cells. International Rectifier Corp.

108 Safety Switch Design—The advantages of the contact design principle utilized in a line of safety switches are stressed in 4-pp Bulletin 415. Text is illustrated by photos showing how this type of switch works, how it is built, its off and on positions. Also describes other features, emphasizing the front-operated rocker handle Mechanism. Bull Dog Electric Products Co.

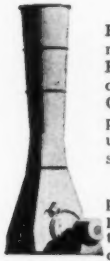
109 Centrifugal Switches—Bulletin 1001, 4 pp, describes and illustrates pilot circuit switches for machine tools, processing rolls, paper mill equipment, conveyor systems, fans and motors. A large cutaway drawing is used to show construction features which provide for dependable performance. Text covers applications and recommends models best suited for various jobs. Includes dimensional diagrams, data on contact rupturing capacities and operating ranges. The Euclid Electric & Mfg. Co.

110 Plugs, Receptors, Connectors—Twelve-pp Catalog EL-49 features small, automatic locking plugs, receptacles, and cord connectors for many industrial applications. It is replete with illustrations, dimensional drawings and convenient ordering information. Illustrates and discusses in detail the automatic locking feature as well as other advantage of the line. Russell & Stoll Co., Inc.

111 Enclosed Switches—A newly developed type of front operated enclosed switch, according to Brochure TEC-1, 4 pp, is presented as having distinct advantages aimed toward ease of installation, maintenance and improved safety. All features of these

(Continued on page 56)

A 3 IN 1 DRAFT PRODUCING UNIT



Prat-Daniel Fan Stacks, manufactured by the Prat-Daniel Corporation of East Port Chester, Connecticut, offer a complete draft producing unit, from I.D. fan to stack for any size boiler.

Sold as a complete packaged unit, this stack provides the answer to that bothersome problem of predetermining the draft of an "assembled" job. The Manufacturers state that efficient draft is dependent on the coordination of three factors: the fan, breeching and stack. Efficient operation depends on the balance of each component to the others and to the installation as a whole. In the P-D Stacks, breechings are in a straight line, reducing normal losses inherent in the usual installation where each of the components are manufactured separately and assembled on location.

Sold as a complete packaged unit, P-D Stacks are mounted directly on the boiler in many installations and may be manufactured to accommodate almost any horsepower boiler. Complete information on the P-D Fan Stack is available on request.

MULTIPLE TUBE, SMALL SPACE DUST COLLECTOR

Multiple tubes offer two important advantages in dust collection, according to Prat-Daniel, East Port Chester, Conn., Manufacturers of the Prat-Daniel Tubular Collector.

First, the close nesting of these small tubes offers savings in space that cannot be obtained where large cyclone collectors are used. This method of construction also permits variations in height and width to conform to odd shaped spaces.

Second, the use of small diameter tubes provides a higher centrifugal force with consequent trapping of the finer dusts. This is accomplished with lower velocities that reduce erosion hazards. In many installations after a period of use, original scale was still evident on the inner surfaces of the tubes even where pulverized coal was used.

Prat-Daniel also manufactures the P-D Duplex Collector in which finer dusts remaining in the gas stream are concentrated to the outer walls of the smaller diameter outlet tube and skimmed off through an annular space with approximately 15% of the gas. This dust is then passed through a secondary collector, thence to atmosphere. The Manufacturer claims lower installation cost and less space than would be required of a series unit, yet collection efficiencies are exceptionally high.

HEAT YOUR PLANT

Independently

WITH

THERMOBLOC

. . . regardless of your source of power

If you buy operating power, or generate it with a diesel unit, you should look into the advantages of THERMOBLOC as a heating source for your plant.

THERMOBLOC is a self-contained, oil or gas, direct-fired, industrial heating unit that delivers just the right amount of heat directly to the working area. Direct heat transfer from the products of combustion to air eliminates the need for expensive, involved piping or ducts. Just place one or more THERMOBLOCS at strategic points throughout the plant, hook up power and fuel lines, and they're ready to go! Low first cost and continued inexpensive operation offer unbelievable savings in plant heating.

THERMOBLOC is available in two sizes: Model 300 delivers 300,000 b.t.u.'s (heating approximately 2500 to 3500 sq. ft.), occupies a 30" diameter floor space and is 7' high. Model 550 provides 550,000 b.t.u.'s (heating approximately 4500 to 6500 sq. ft.), is 30" in diameter and 10' high. Both units are automatic and operate at 82-86% efficiency on No. 3, oil or gas and are Underwriters' Laboratory Listed.

Fill in the coupon and get your copy of the latest bulletin on this new method of heating.

THERMOBLOC DIVISION

PRAT-DANIEL CORPORATION

Manufacturers of Prat-Daniel Power Equipment

EAST PORT CHESTER, CONN.

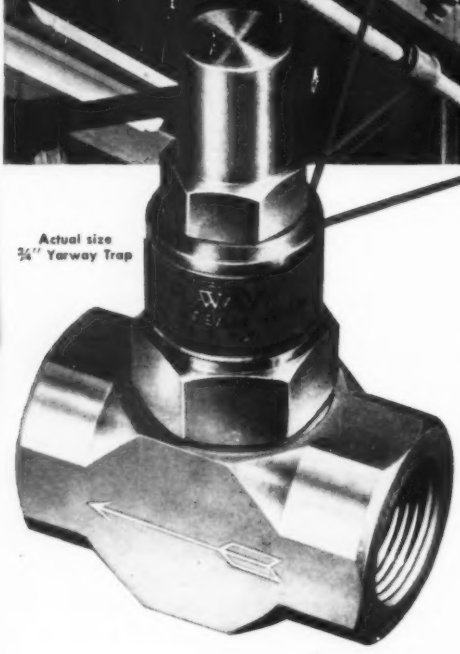
Gentlemen:

Please send me your bulletin "Packaged Industrial Heat."

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....



Actual size
¾" Yarway Trap

For space heating and for process work, the story is the same—Yarway Impulse Steam Traps get equipment *hotter, sooner and keep it hot!* You hear it at little plants and big plants, wherever Yarways are used.

The installation shown above is at the Ingram-Richardson Manufacturing Co., Frankfort, Ind. Here 23 Yarway Impulse Traps with Yarway Fine Screen Strainers are doing a completely satisfactory job on Unit Heater installations, finned pipe heaters and pickling tanks.

Yarway Impulse Traps discharge *continuously* under heavy loads, *quickly* bringing equipment to operating temperature. Then they keep equipment at *peak efficiency* by discharging condensate at *short intervals,* rather than waiting for quantities of it to collect.

Other Yarway advantages—small size, easy maintenance (only one moving part), good for all pressures without adjustment, low cost.

See your local distributor, or write . . .

YARNALL-WARING COMPANY
145 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY IMPULSE STEAM TRAP

Plangineering

Planning, ingenuity and engineering are responsible for the successful completion of many projects. If you have done a job you're proud of, send us a photograph and brief description. Every one accepted from a reader will be paid for. Manufacturers also note

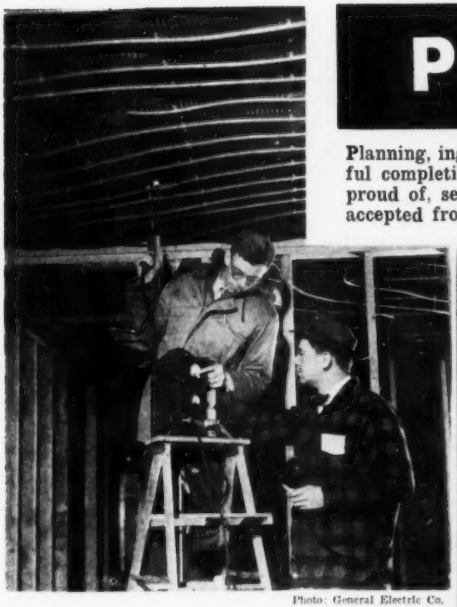


Photo: General Electric Co.

• **Encore** — A repeat appearance for the leak detector shows it in use testing radiant heating systems. The instrument is sensitive to halogens—chlorine, fluorine, bromine, iodine. The system has Freon in the 1800 ft of copper tubing. When the pistol-shaped pick-up passes through the surrounding air the presence of Freon is noted on the dial. About 100 joints were tested in this manner in an hour. Three leaks, undetected by different previous tests, were spotted immediately. The leak detector also has been used for testing fuel tanks, instruments.

Photo: Texas Engineering & Mfg. Co.

• **Hose Slipping?** — A new hand tool devised by Irvin Dodd of Texas Engrg. & Mfg. Co., Dallas, is this new hose clamp tightener. It is an adaptation of a standard socket wrench. A slot is sawed across the face of a $\frac{3}{8}$ in. socket to accommodate the clamp key and the socket itself is surrounded by a $\frac{3}{4}$ in. bell. The bell keeps the key from slipping out of the slot and prevents the socket from spreading where it has been cut.

• **The Mountain, Not Mahomet** — Below: Instead of isolating a 5000 lb board hammer at Spicer Mfg. Co's. Toledo plant, they isolated the 20 ton furnace that was being damaged repeatedly. In fact, J. C. McElroy, Asst. Supt. of the Forge Div., points out that the life of the arch and top of the furnace have been increased nearly $2\frac{1}{2}$ times.

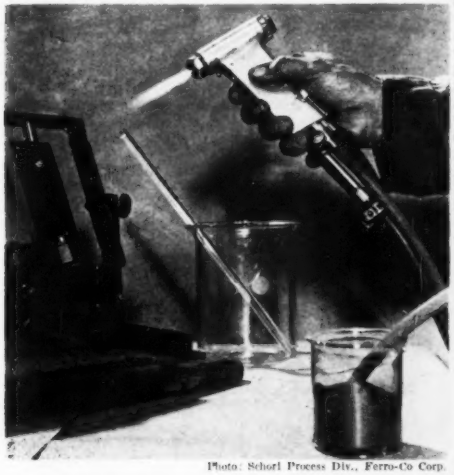
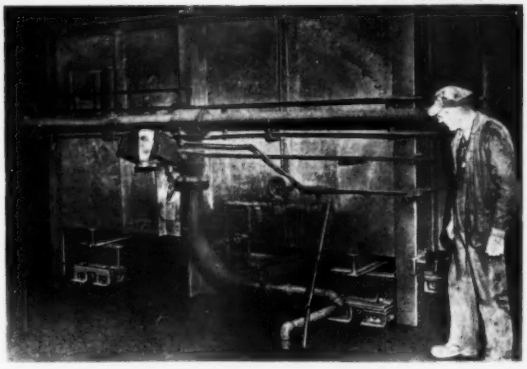


Photo: Schori Process Div., Ferro-Co Corp.

• **Let Us Spray** — This Flame Spray Powder Pistol lays down films of new materials quickly and inexpensively, it is reported. Among the things that can be done with it are: spray pigmented powders, plastics, mixtures or blends, spray protective coatings such as chemically-resistant linings on tanks, conductive metals on plastics, non-conductive plastics on metals; spray electrical circuits; solder contact points; spray tin for ease in tip wiping; *ad infinitum*.

Photo: The Korfund Co., Inc.



When You Handle Lumber —Do It Economically

Car unloading at working level . . . No re-handling thru open car storage dry kiln and closed storage to production line . . . This plant goes all out on modern handling, storage . . . Labor savings . . . Increased production . . . Inventories cut one-third at Osborn Mfg. Co.

COMPLETELY integrated, a new wood drying and handling system which will afford substantial monetary savings, increase production of the company's maintenance brush products and reduce lumber inventories, has recently been installed by The Osborn Mfg. Co., Henderson, Ky. plant. The project includes a new Standard dry kiln of 40,000 board feet capacity, the latest type of lumber unloading equipment and an efficient arrangement for grading and storing lumber directly on kiln bunks.

The kiln itself is housed in a cement block building with brick veneer and concrete floors throughout. Seven internal motor-driven fans shown by Fig. 6 have been provided to circulate steam-heated hot air around the wood and to help maintain a controlled temperature. Steam is released into the chamber under Foxboro automatic control when the humidity drops below a set limit.

Two Leitelt screw type lumber lifts are installed, one at the initial unloading point and the second in the wood shop where the transformation of wood into brush handles and other parts begins. Both lifts can be lowered or raised to position, the lumber being loaded or unloaded at a convenient working level, eliminating a separate handling operation at each end.

Fig. 1. As lumber is unloaded it is stickered and placed directly on the kiln bunk and remains on the bunk until it goes to the saw. A lumber lift or work positioner keeps the top of the stack always at a convenient working level. A gasoline powered lateral transfer, operating on tracks in the shallow pit visible in the foreground, switches bunks to short sections of track for open-air storage until ready for kiln drying. Kiln has a capacity of 40,000 board feet and lumber usually remains about 10 days

A Leitelt gasoline-powered transfer is used for moving the kiln bunks from the unloading docks into green storage, from there into the kiln, into the tempering shed and then directly into the wood shop. A winch on the transfer car also provides motive power for moving the bunks. Sufficient trackage has been installed to take care of all lumber storage, green or air dried. Once a carload of wood has been unloaded on kiln bunks, it is not rehandled until delivered to the shop for manufacturing operations.

Fig. 2. Lumber, dried to about 8 per cent in the kiln, being transferred from the kiln to the dry-storage shed across the rails of the tansfer. It is stacked just as originally unloaded from the freight car, and has gone through green yard storage and kiln drying without re-handling. Note ends of short track sections for yard storage, visible beyond kiln buildings. Doors and heaters have yet to be installed on the dry storage shed

Modern wood dust and shavings conveyors run directly into the boiler and a wood hog quickly disposes of scrap pieces. This scrap is fed into the hog as it accumulates to save an extra cleanup operation, and the material leaving the wood hog is blown to the boiler room. Chips and shavings drop from a cyclone to a storage bin and are fed to the boiler as needed by a conveyor. Scrap wood thus used supplies sufficient steam for dry kiln and heating requirements.

In addition to the apparent savings which result from more efficient wood handling, further cost reduction is expected through the elimination of outside drying. More important, the new setup, now completely under Osborn supervision, will result in more closely controlled seasoning and further improvement in the quality of brush handles and other wooden parts. Inventories are expected to be reduced by as much as one-third.

Fig. 3. Here the bunk of lumber moves from dry storage into the mill pulled by a cable and pulley arrangement powered by a winch in the transfer car

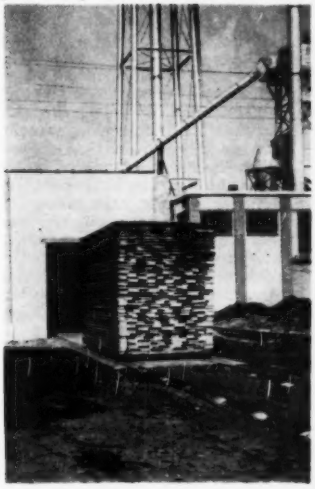


Fig. 4. Still stacked on the original bunk, the lumber is fed directly into a gang rip saw, handled for the first time since unloading from the freight car. The bunk is on a platform over a pit in which is installed a motor driven, screw operated lumber lift, keeping the top of the stack at a convenient working level for the saw feeder. Waste pieces pass thru hog and are blown to the boiler room

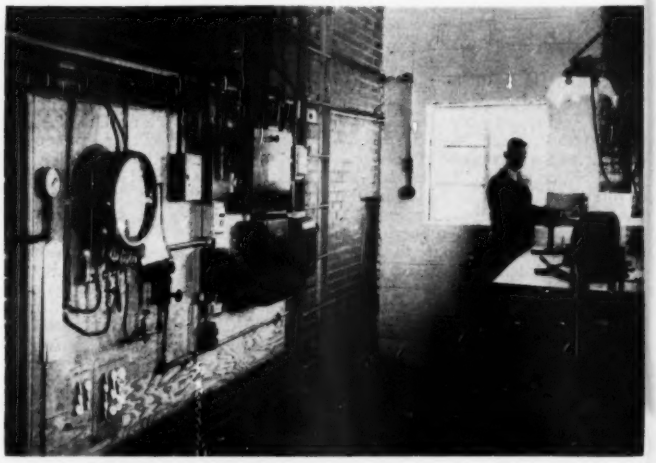


Fig. 5. Along with the mechanized lumber-handling system, Osborn installed a modern battery of dry kilns with a capacity of 40,000 board feet. Lumber remains in the kilns about 10 days. On the wall of the operating room are seen the Foxboro instruments for controlling and recording temperature and humidity. Lumber is dried to about 8 per cent. All steam traps are installed outside the kiln buildings. Douglas K. Bland, Staff Engineer, supervisor of kiln operations, is shown weighing a sample of dried wood

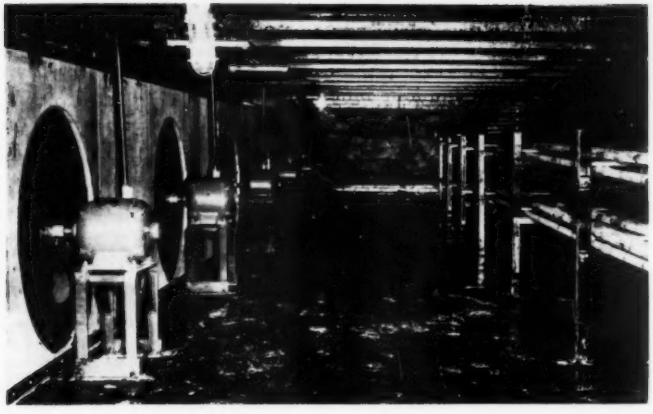


Fig. 6. Hot air tunnel over the kiln operating room. Steam pipes are seen at the right. Motors driving the battery of six fans have glass-fiber insulation to resist the high temperature and humidity which vary with the original condition and species of the lumber. This new system not only reduces material handling cost, but, as pointed out in the accompanying article, puts the entire control of lumber quality directly under Osborn supervision, a distinct advantage

Paper Work CAN Simplify Maintenance Programs

This system consists of Repair and Supply Orders, Supply Cards and Records, Labor and Material Maintenance Cost Record for each piece of equipment in the plant, a Maintenance Control Board, a Storekeeper and a Dispatcher . . . Advantages of system: Gives maximum information to supervisory personnel, cuts down on clerical expenses, affords positive control of maintenance workers and jobs, and curtails waste

By THOMAS E. HANSON, Managing Editor, Plant Engineering

MAINTENANCE COSTS are entrenched as a major item of operating expense in industrial plants. In an attempt to alleviate the burden many companies have aggravated the condition by instituting an over-elaborate system of costs and records. High paper work costs are thus piled on already topheavy maintenance budgets.

Realizing these dangers, the Plant Engineering Department of Link-Belt Co's Pershing Road plant in Chicago, headed by Harry Anderson, Works Engineer, set out to perfect a paper work system which would give maximum information to supervisory personnel and at the same time curtail clerical expenses, afford positive control of workers and maintenance jobs, clamp down on waste and "midnight requisitioning." This system has now been in operation for more than a year and while Mr. Anderson frankly admits, " . . . there may still be bugs in it," they have yet to call for the Flit.

Staff Technician Ralph Kresge has worked most closely with the development of the forms and procedures of the entire system. He explains it as follows:

All Repair and Supply Orders, Fig. 1, are filled out by the supervisor of the department in which the machine or equipment is located. Each supervisor has been supplied with a manual listing every machine in the department with its number. This number is also stenciled on the machine in a prominent spot.

Supplied with this manual is a list of "T" Numbers which designate to what department the work is to be charged. The particular job shown in Fig. 1 is repair of a chain hoist and the T-Number for the job is T20312. The maintenance department will not honor a Repair and Supply Order which does not carry a T-number.

These Repair and Supply Order forms are made up in triplicate (original, white; duplicate, yellow; and triplicate, pink). The original and the yellow duplicate are sent to the maintenance department while the pink copy is held by the supervisor who originated the order.

In the event of an emergency, the divisional superintendent may request help by phone. The call, however, must be followed immediately by an order marked "confirming." Space is provided on the form for a rough sketch of any parts which must be made up by the maintenance department. All dimensions must be shown on this sketch.

When the order is received by the Dispatcher in the Maintenance Supervisor's office, the order is checked for "date required" and "parts required." If "date required" has been entered by the supervisor the job is scheduled to be completed by this date. If parts are required, the Dispatcher checks with the General Maintenance Storekeeper. If the part required is not in stock the Storekeeper immediately places it on order with, if possible, a delivery date which will permit the work to be done on schedule.

The Storekeeper and the Dispatcher are key figures in the savings shown by this system. Where all stores are allocated from a central system with several clerks filling orders from hundreds of sources there is a standing invitation to the honest workman to fill, by simple appropriation, his many home and automobile needs. The "they'll never miss it" school of thought has been a constant drain on industrial plants for years.

At Link-Belt one man is responsible for all maintenance supplies. The key to his usefulness is the visible record card system, Fig. 2. When incoming shipments are received by the Maintenance Storekeeper he checks quantities and specifications against requisitions previously written. Receipt of the stock is entered on the card. Often stock is requisitioned from the regular store room and then carried as a sub-stock in the maintenance storeroom. The maintenance storeroom is a time saver inasmuch as it is located next to the Dispatcher's office. Various craftsmen pick up necessary parts before leaving for jobs throughout the plant.

After invoices are returned from the accounting department, the Storekeeper checks prices against previous quotations or price lists and posts the prices on the card in the proper column. Material delivered for a special job is earmarked

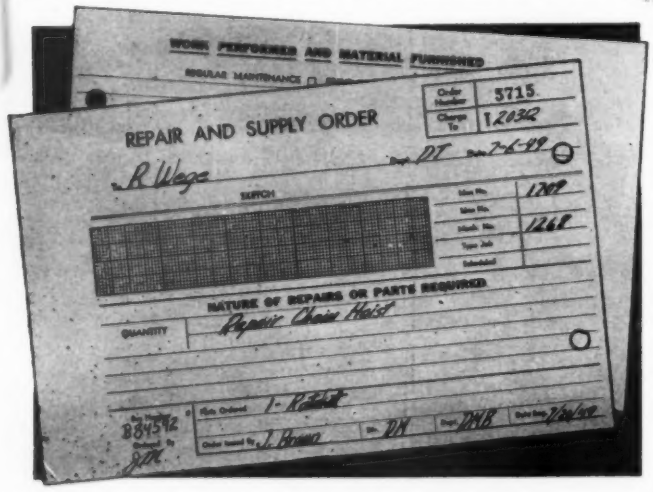


Fig. 1. Repair and Supply Orders originate, in triplicate, in the department where the work is to be done. Reverse side of order, shown at top of cut, has space for detailed data on work done and material supplied, labor and material costs

for this particular job and the Dispatcher notified of their arrival. The entire operation results in a perpetual inventory of all maintenance stores and the coordinated operation of Dispatcher and Storekeeper assures an uninterrupted flow of workers and materials to the job with a minimum of lost motion.

Duties of Dispatcher

As soon as the Dispatcher has checked necessary parts with the storekeeper he schedules the job and places the Repair and Supply Order in the "Pending Orders" compartment on the Maintenance Control Board, Fig. 3. The names of all workers employed in the Maintenance Department are lettered on wooden name plates and are hung on hooks under the headings of the particular craft in which they work, i.e. carpenters, millwrights, etc. They appear in the order of their seniority.

Opposite each name, in the "Order Number" column, is a space for chalk entry of the work order number on which that particular worker is employed at the moment. If the maintenance dispatcher or the plant engineer wishes to know where any maintenance man is working he need only look at the work order number and then refer to the file of orders in the "Current Order" compartment. If the man is sick, on leave of absence or vacation, this too shows up on the board.

Maintenance Cost Cards

On completion of the work order costs of parts and labor are obtained from the accounting department. These are entered on the Repair and Supply Order and all pertinent information is returned to the divisional superintendent who originated the order. Labor and material costs are then transferred to the Labor and Material Maintenance Cost card which is a part of the permanent visible card record system, Fig. 4, kept in the dispatcher's office. From this record, any authorized individual can ascertain the maintenance costs on any one of the hundreds of pieces of production and service equipment throughout the plant.

At the end of each calendar year the amount spent for maintenance on each of the machines is entered in the proper place at the bottom of the card. When costs for one of a group of similar machines or pieces of equipment runs considerably above normal rebuilding or replacement may be indicated.

The reverse side of the card, Fig. 5, contains complete information on the preventive maintenance program for each machine. By means of trial and error, coupled with experience and cooperation of other departments, definite schedules are made for a complete program of preventive maintenance. The bottom of the card is divided into 52 sections, one

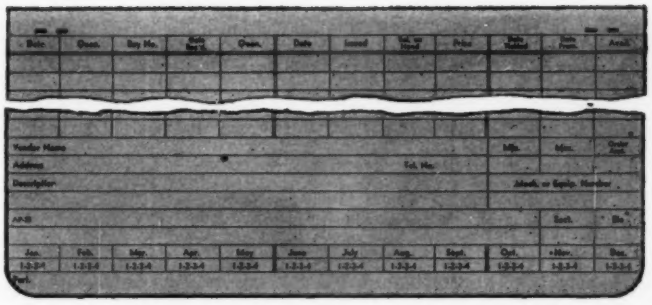


Fig. 2. An abbreviated version of the Storekeeper's record card. It gives him complete buying and supplying information, tells him if parts are on hand or must be ordered

for each week of the year. Space is provided for yearly totals for a 4 yr. period. Check marks are made at the points where the preventive maintenance work should be done and a system of colored flags attached to the bottom of the cards warns the maintenance department of approaching inspections.

As summarized by Mr. Kresge the advantages which this system offers a plant engineering department are:

1. Eliminates costly confusion from more than one order or request for the same job.

2. Avoids misunderstanding, garbled instructions, failure of orders to reach proper craftsman in time for prompt repair. Prevents time-consuming mistakes resulting from unauthorized or ill-informed personnel requesting repair service not necessary.

3. Affords a means whereby each department supervisor can check costs of jobs immediately; it imposes reasonable limits of control on these supervisors and promotes greater cooperation with the plant engineering department.

4. Helps expedite emergency work.

5. Secures quality workmanship.

6. Reveals idle time and separates efficient workmen from the inefficient.

7. Affords means for scheduling working force and provides readily accessible information relative to the maintenance schedule.

8. Permits positive operation of any type of preventive maintenance program.

9. Maintains knowledge of current location of all members of maintenance department for immediate availability in case of emergency.

10. Expedites recording of costs of construction and maintenance for use in determining operating costs of fixed assets; provides accurate comparative costs for future estimates and makes cost information

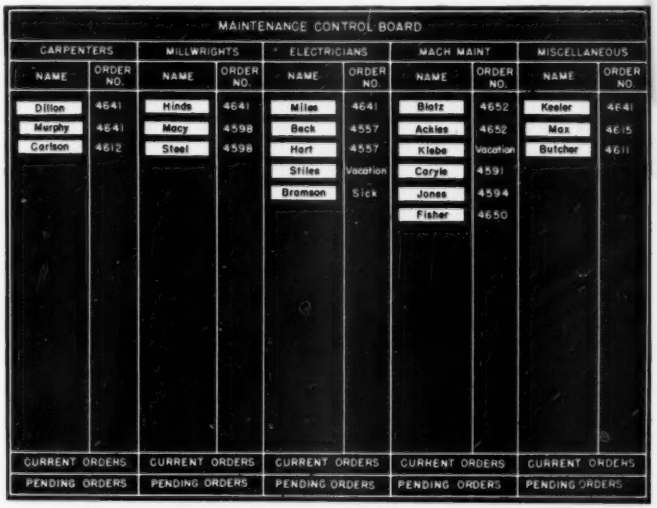


Fig. 3. Maintenance Control Board enables supervisors to locate any maintenance worker in the plant simply by reference to Order Number in the "Current Orders" box at bottom of Board. Leave of absence, vacation or sickness is also recorded on Board

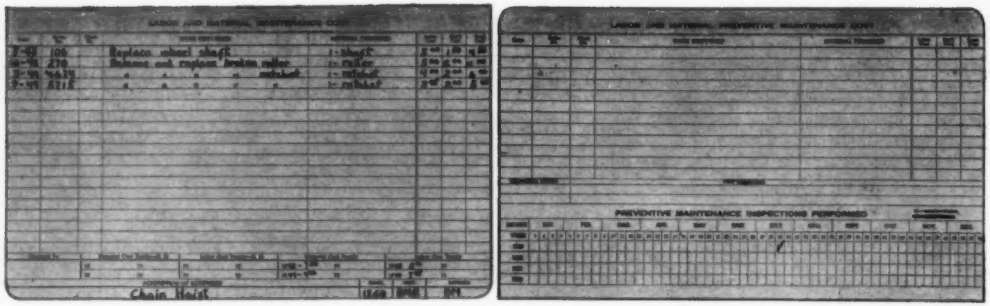


Fig. 4. Left: Every machine in the plant has its tell-tale card in the Dispatcher's visible card system. When maintenance costs get out of line with those for similar machines, new equipment may be necessary. Fig. 5. Right: Reverse side of Fig. 4 contains preventive maintenance record. A system of colored flags can be used to warn maintenance personnel of approaching preventive maintenance period

available for more adequate budgeting figures for future planning.

11. Permits cost of construction and maintenance to be controlled by individual job instead of by averages taken at various periods of time.

12. Makes available for maintenance supervisor a source of practical information of job experience, skill and reliability among the various craftsmen employed by the maintenance department.

Retreading Walking Areas

Safety treads don't always stay safe and replacement of large areas of treads is a problem . . . Abrasive paints, cleats, chiseled surfaces and other methods vary in cost and effectiveness . . . Principles of operation of vibrating electrode . . . Cost of method and different applications

By JOHN E. WAKEFIELD

SLIPPING IS one of the most common causes of serious injuries and accidental deaths each year and industrial plants are becoming more and more conscious of this problem. Modern plants are all equipped with safety surfaces on walking areas.

The trouble is that safety treads don't maintain their non-slip qualities indefinitely. Some are excellent when they're dry, but quite dangerous when wet or oily. Steel safety treads particularly become polished from constant traffic, and lose their grip in a comparatively short time. Steel nosings on concrete steps become very smooth and slippery. The maintenance department is faced with the problem of finding ways to restore safe walking surfaces, and it's no small problem.

Replacement of steel safety treads and nosings is one way, of course. Usually it is difficult, for whole sections of stairs and platforms must be torn out. It is almost always expensive, but less so than "lost-time" accidents.

Abrasive paints, trowelling compounds or cleats are less expensive, but usually give only temporary protection. Some maintenance men have resorted to such makeshift methods as chiselling the surface. Various patterns are produced which rough up the surface and provide a certain amount of grip.

One method of restoring safety treads is a rather ingenious adaptation of the welded bead. It seems to be much more practical and produces a better non-slip surface and a more permanent one.

A special tool has recently been developed for the sole purpose of applying very irregular file-hard beads to worn steel treads, platforms and nosings. The electrode passes through the center of the main casing assembly and is held by a collet. The finned barrel at the front is the collet closer, to draw the collet tight on the electrode.

Vibrating Electrode Method

A welding cable attaches to the tool and is connected to any ac or dc welding machine operating at 75 to 125 amp. Inside the main casing above the handle is a vibrator operating on 110 v ac. The attachment cord for the vibrator passes through the handle and is plugged into any 105/125, 50 or 60 cycle ac outlet.

The vibrator causes intermittent arcing of the electrode. This, of course, melts it and fuses molten droplets to the base. Intermittent arcing reduces penetration to some extent, but still maintains ample depth for strong bonding. Speed is increased greatly and the very irregular bead produced is much better for slip-proofing than a high continuous bead.

The tool is held lightly in hand, and the electrode is drawn along the surface, much like drawing a chalk line with a pencil. Due to the vibrator, the electrode bounces along quite rapidly. This makes and breaks the arc. Movement of the electrode across the surface is at the rate of about 5 ft per min, and it is this high speed that makes the process so economical. Lines may be made free-hand or a piece of wood can be used as a straight edge. Very little heat is developed except at the fusing point, and even this is not great enough to crack cast iron or burn through a thin steel plate.

Any desired pattern can be laid down, with lines spaced closely or as far apart as will give the desired results. Generally, a geometric pattern is used, consisting of squares or diamonds.

The real advantage of the process lies in the irregular beads and the type of electrode used. The deposited metal is file-hard and the hardness goes all the way through to the base. That means that there will be very many times the wear and much longer protection against slipping. Beads can't wear smooth, because the irregularity also goes through to the base.

Very extensive tests have been made in a number of places to find out what effect oil and moisture has on these beads. There seems to be little, if any, loss in gripping quali-

This tool vibrates the electrode in order to lay down a beaded pattern of safety treads. Note the difference between the left and right sides of the stair treads

ties where even considerable quantities of oil or water have been encountered. Furthermore, it has been found that beads can be applied to dry, wet or oily surfaces without any special surface preparation. A better bond will be obtained if the surface is reasonably clean, of course. However, cleaning previous to the application of beads is in no way a critical problem.

Traffic Resistant

The greatest advantages of this process are clearly the strong positive grip, and the fact that the beads will stand so much traffic for so long a time. Another advantage is the simplicity of the operation. No great welding skill is required, for it is not necessary to maintain an arc. The vibrator does the real and desired work. The manufacturers of the tool claim that it is "as easy as drawing a chalk line." In the author's opinion, it isn't quite that simple, but there is certainly nothing difficult about it.

The most common fault is holding the tool too tightly. A light, free grip seems to produce the most satisfactory work. The electrode should not be burned too close to the collet, and it shouldn't be extended much more than 5 in. from the front of the tool. Fusing of the electrode to the work can be caused by holding the tool too rigidly or at a wrong angle. Generally, not less than 45 deg to the work gives the best results, although this doesn't appear to be critical either.

One other thing. Don't be concerned if a few particles scrape off the work fairly easily. There is always a little checking, with a few particles poorly bonded. The number of these is very small and of no real importance to the overall result.

Cost of the Method

When it comes to cost, the method is pretty much in a class by itself. A diamond pattern, with lines about 2½ in. apart will require 10 lin. ft of bead for 1 sq ft of surface. That takes about two minutes to do, since the tool should be moved about 5 ft a minute. In most cases, that will represent about 5 cents labor cost. One inch of electrode will make nearly a foot of bead. Therefore, 10 in. of rod will do 1 sq ft of this particular pattern. Cost of 10 in. of rod is approximately 2 cents. Power runs about ½ cent per sq ft. Allowing for human inefficiency, a reasonable cost per square foot will be 10 cents. Other methods have been estimated all the way from 10 cents a foot for chiselling to 50 cents a foot for emery cloth cleats.

Metal is frequently used for stair treads, landings, trench covers, man hole covers, ramps, doorsills, machine platforms, foot pedals, running boards and portable plates used on shipping docks. One company had an aisle with a wooden floor, over which a good deal of heavy trucking was done. They applied beads to ordinary steel plates and covered the wood with them.

The transportation industry seems to have become aware of the slipping problem more than others. This method can be used to advantage on bus and car steps, car platforms, metal nosings and platforms in stations. There are still other spots in stations and walkways where the method would be applicable.

The metal producing industries have also begun to use the vibrating electrode method quite extensively. Steel companies particularly seem to have quite a number of places which need retreading. It is understood that Republic Steel, Carnegie-Illinois, Jones & Laughlin and a number of others have the tools in use already.

The use of the process is by no means limited to those industries, however. Chemical plants, food processing companies, oil refineries and other large manufacturers are retreading iron and steel walkways, nosings, landings, and so on.

Form Lining Helps Produce Better Concrete and Surfaces

Photo: United States Rubber Co.

Staple guns or special adhesives can be used to attach this form lining to the wood forms. Better resistance of the concrete to abrasion, freeze-thaw cycles is described as one advantage. Furthermore, the lining is responsible for better appearing concrete surfaces which can easily be painted. Absorption of excess water said to be key to performance ● The lining can be trimmed easily with a knife or shears and its flexibility permits it to fit readily to curved or arched forms which have a single direction of bend and a radius of 10 in. or more

This Method Helps Speed Suspended CEILING CONSTRUCTION

Wide nailing course of the channels speeds work but still results in complete and effective locking of every nail . . . Practical, both structurally and economically, for constructing suspended ceilings where asbestos board, gypsum board or structural insulation board are used as a finish . . . Permits wide variety in use of backing or backerboard materials . . . Provides safeguards against vibrations, sudden shocks

Plant Engineering
Product Application Feature

A RECENT development in the field of suspended ceiling construction has gained recognition for its simplicity and speed of installation. As with older types of suspended ceiling systems, the method involves the use of an inverted heavy gauge steel "U"-shaped nailing channel. A steel rod, fastened in the center of the channel, serves as an anchor for nails. The curved channel walls guide the nails around the rod for a secure and permanent anchorage. The average holding power of the nails, according to laboratory tests, is about 122 lb.

Other principal parts of the Nailock assembly consist of patented spring lock clips for fastening nailing channels to the carrying members; splice lock clips for uniting adjoining ends of the nailing channels for added strength and rigidity; and metal end lock clips which furnish the means of installing backerboard in perfect alignment, and sealing the cross joints. This eliminates breathing, prevents dust and dirt from settling, and permits the boards to be joined without wasteful cutting at the nailing courses.

Prior to the development of such patented methods of suspended ceiling construction, acoustical tile was hung in sections without the use of backing material. This non-rigid type of construction had numerous drawbacks. Ceilings could not be leveled perfectly, and shocks or blows could easily dislodge the tiles. Dirt and dust settled through the ceiling due to the lack of backing materials. Hence, the advantage of the development; it permits the use of backerboard material for a sturdier, rigid, reinforced backing to which tile can be firmly attached. A more complete dirt and moisture-proof installation is possible because the backerboard joints are completely sealed. A further advantage, of course, is the efficient fire stop which the backerboard makes, plus the incombustibility of the components.

Numerous instances show that the advantages of the method are manifold. The fact that it is dry construction eliminates drying time usually encountered with other methods . . . before finish may be

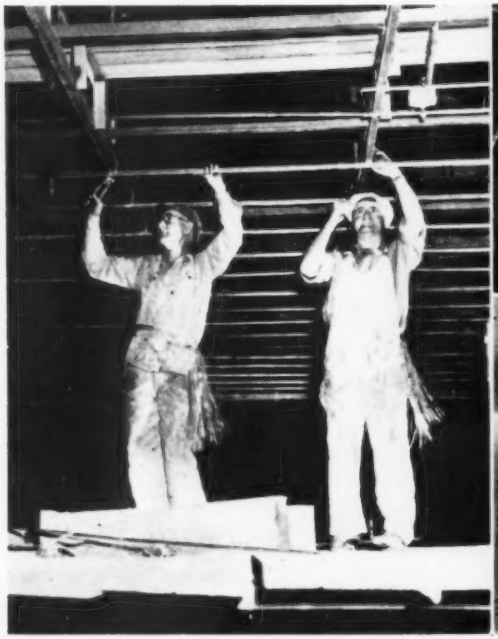


Fig. 1. Nailing channels being attached to carrying members by use of wire tie. This suspended ceiling installation covers a total area of 100,000 sq ft divided into three equal sections. This type of installation provides protection against excessive vibration and damage that might occur from sudden shocks or from structural adjustment within the building

Fig. 2. The solid backing for the acoustical tile or other type of finish is nailed directly to the nailing channels and provides a solid surface to which the small units of tile can be mechanically fastened by screws or by cement. The special nails used in the job form a locking loop around the rod and assure rigidity and permanency of installation

applied. It also provides incombustibility, because the backerboard for acoustical tile and other ceiling materials is installed without using wood furring or studs. In remodeling operations, further advantages of this system become apparent. Again, because it is dry construction, there is less attendant dirt and muss.

The principal value of the method, however, is based on the speed of assembly of the metal channels and components to carrying members. Because of this, larger board installation crews can follow up in larger areas to materially reduce construction time. The ¾-in. wide nailing channel provides a nailing course wide enough so that all nails strike somewhere within its limits. This, too, speeds construction while at the same time providing a sounder structure. Its rigidity and holding power provides a safeguard against vibration, sudden shock and damage to ceilings resulting for structural adjustment.

While expanded metal lath for plaster finish may be employed the plastering step may be eliminated entirely if acoustical tile finish is specified. Thus, in many instances the installer saves from 10 to 14 days waiting time which would be required for the scratch, brown and finish plaster coats to dry before the acoustical tile could be installed. In one large California installation, the time saved in this respect amounted to almost six weeks.

Because the suspended ceiling installation may be completed any time after the wall plaster had dried, the resultant increased ventilation also helps to speed drying time. A comparison shows that the methods of suspended ceiling installation for plaster and for structural insulation board are identical through the steps of fastening the carrying members to the hangers. More work is involved in the former, however, because, due to the reduced weight of "dry" construction, the carrying members for the latter may be hung on wider centers.

When incorporated into original specifications for steel joist supported or concrete ceilings, the steel nailing channels provide an economical, practical furring method. For ribbed or pan-type concrete ceilings, a strong, firm anchorage is provided by fastening the nailing channels in the wood forms and pouring the concrete around them. This provides an anchorage shown by laboratory tests to resist loads up to 1710 lb per in. Expanded metal lath for plaster, or various other building materials are installed fast and economically by nailing to the furred channels. When acoustical tile is used, a suitable backerboard or backing material is required.

Fig. 3. Acoustical tile is mechanically fastened by screw to double-laminated backing material. Patented screw-retaining core provides positive attachment of each tile unit yet allows for easy removal in emergencies without damaging tile. Backing is an effective fire stop, while air-tight joints between the boards eliminate breathing and air penetration

All photos, Sanymetal Products Co., Inc.

A third method of ceiling construction is used and involves the use of hangers dropped to the proper level to which the metal carrying members are fastened. The patented nailing channels are attached to these at right angles.

The recommended method requires the use of No. 8 wire hangers spaced on 4 ft centers. These are started within 6 in. from each wall. The carrying members, generally specified to be 1½ in. cold rolled channels, are attached at the proper level and also are spaced on 4-foot centers on hangers every 4 ft.

Depending upon load requirements, the nailing channels are located on centers ranging from 12 to 24 in. For maximum strength and ease of installation, the channels are fastened to the carrying members by means of the patented spring lock clips. Other methods are available, and include attaching by means of saddle or stirrup wiring of double No. 16 gauge wire, and tack or acetylene welding.

When acoustical tile is to be used, the entire ceiling area is covered with a solid back of double-laminated board. Thickness of the board varies from 9/16 to ½ in., depending on the method used for attaching the tile. The former thickness contains a screw-retaining core, and is used where the tile is mechanically fastened. The latter thickness—without the core—is required where the tile is to be cemented in place. The backerboard is fastened to the nailing channel at right angles, with the nails spaced not more than 5 in. apart. The edges of the backing boards are required to extend beyond the channels so that the end lock strips may be installed at every cross joint.

Because of its strength and rigidity, this system is practical for ceiling suspension where any type of structural insulation board is used. It is interesting to note that the Nailock method does not alter the usual methods of suspending ceilings, but permits the use of the widest variety of backerboard materials, or any type of acoustical materials which might be attached by cementing or by mechanical means.

As mentioned earlier, one of its chief advantages is the speed of assembling for subsequent finishing operations. It is of interest to note that the distance between the edges of the nailing channel permits a wide nailing course which also helps to speed installation of backerboard. Regardless of where the nail point strikes the channel—either side, or on the rod in the middle—it is automatically deflected into the course.

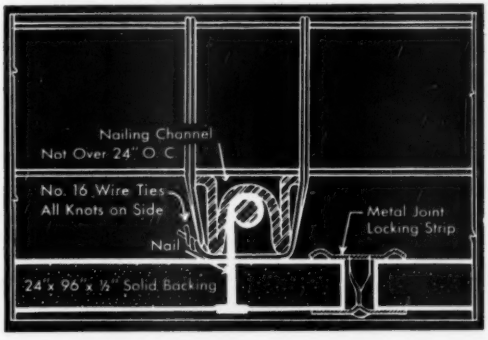


Fig. 4. Nailing channels or furring strips may be fastened to carrying members by means of 16 ga wire tie as shown here. Backing board is then nailed to the nailing channel and it provides a good foundation to which the tile may then be fastened

Readers desiring complete specifications, prices and more detailed information on this system of suspended ceiling construction please write The Editor, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill., or just mark "Suspended Ceiling" on one of the handy, no-postage-required cards elsewhere in the issue.

How to Build Safety into Transformer Installations

Protection against lightning and surges . . . Prevention of electrical breakdown in oil-cooled transformers . . . Care and purification of oil . . . Protection against mechanical injury . . . Methods of extinguishing transformer fires . . . Complete transformer installation tables given

By R. H. OPPERMANN, Engineer, Associated Factory Mutual Fire Insurance Companies

THE TRANSFORMER is perhaps the most rugged of all electric power equipment, therefore it is often neglected, forgotten, abused and overloaded. When a breakdown does occur, there is surprise and wonder why such a thing should happen. Where there is a good installation with good maintenance, a long, useful, and satisfactory service can be expected from well-designed and constructed transformers.

Continued good service is dependent on well planned and well maintained installations. The most important factor is the prevention of electrical breakdown and possibly fire. Failure can occur from lighting discharges or surges creating excessive voltage which breaks down insulation. The resulting arc releases energy, creating a bursting pressure within the case. The gases and oil vapor liberated from ruptured cases of oil-cooled units may be ignited and unless checked will burn with increasing fury. Other causes of transformer failure include the presence of foreign matter in the transformer, loose connections, dirty insulators, overloading, excessive sludge in the casing, and lack of proper ventilation. Old age is also an important factor. A good maintenance program will include a frequent check on all of these items.

Where lightning surges are likely, lightning arrester protection should be provided with a ground connection of low resistance. Proper overcurrent protection for the transformers is also important and for this, reference should be made to the National Electrical Code. Easy and safe accessibility for maintenance is necessary so that oil can be sampled, units moved, insulators cleaned, and repairs made. With large installations it is advisable that busses and structures be kept as far from the transformers as possible, and any complicated or expensive switching equipment or combustibles of any kind should be isolated by fire resistive walls.

The oil-cooled transformer is the most common type in use. The oil is a petroleum derivative which possesses all of the good properties required in liquid dielectrics for transformers. That the oil is combustible is perhaps the most serious drawback. When it is treated with due consideration for its characteristics, it has long life, and this too is an essential part of a good maintenance program. The oil should be given a dielectric test and analyzed for acid, alkali, and corrosive sulphur at least once a year. It should not break down in a standard test gap consisting of 1-in. discs spaced 0.1 in. apart when 18 kv is applied and new oils should withstand at least 25 kv. Moisture is one of the enemies of dielectric strength and it is probably the principal cause of failures. Moisture can enter the oil externally from moist air drawn in by breathing of the transformer.

Fire in bank of three 600-kva transformers. Metal-clad fire shutters prevented entrance of fire into building

Table I. Protection for single-phase or three-phase outdoor oil-insulated transformers which do not expose buildings

Less than 300 kva. each	One to six transformers	No special protection
300 to 1000 kva. each	One to six transformers	$2\frac{1}{2}$ in. portable water spray nozzle and $2\frac{1}{2}$ in. C.R.L. hose
1001 to 2500 kva. each	One transformer	$2\frac{1}{2}$ in. portable water spray nozzle and $2\frac{1}{2}$ in. C.R.L. hose
	Two to six transformers	Permanently piped water spray or low-pressure refrigerated carbon dioxide — Manual Control
Above 2500 kva. each	One transformer	Permanently piped water spray or low-pressure refrigerated carbon dioxide — Manual Control
	Two to six transformers	Permanently piped water spray or low-pressure refrigerated carbon dioxide — Automatic Control

The other principle cause of oil deterioration is oxidation. When oil is heated in the presence of air it oxidizes slowly and objectional by-products are formed slowly which can consist of acids soluble in any water present, acids insoluble in water, and solid oxidation products or sludge. The sludge sometimes prevents free circulation of oil and the dissipation of heat. The process therefore is progressive after a certain point is reached—higher temperatures promote oxidation which produces sludge, and sludge promotes higher temperatures. Temperatures should never exceed 90 C.

Table II. For installations of one or more outdoor oil-insulated transformers rated at 100 kva. or larger, use one of the following recommendations:

a. Move the transformers to a safe place and protect in accordance with kva. rating as outlined under Table I.

b. Protect the building by a blank brick or concrete wall and follow Table I for protection of transformers. In multi-storied brick or concrete buildings where light is required from exposed windows, those in the second and possibly the third stories directly above the transformers should be of wired glass in metal frames, and overhanging combustible eaves should be fireproofed. If transformers are large enough to require automatic spray protection according to Table I, then plain glass wood sash windows are acceptable in all stories except the first story, where wired glass metal sash windows should be provided at exposed openings.

c. Enclose the transformers in a suitable brick or concrete transformer house and follow Table III for protection of transformers.

d. Substitute transformers filled with a non-combustible insulating liquid (Askarel).

e. Provide an approved permanently piped water spray or carbon dioxide system with manual control for an installation consisting of one or more single-phase or three phase oil-insulated transformers rated at 100 kva to 1000 kva and the same protection, except automatic control, for transformers rated at more than 1000 kva and provide wired glass metal sash windows at exposed openings in the first story.

The purification of transformer oils consists of removal of water and sludge, and the neutralization of acids. This may be done economically by the larger industrial plant having many transformers but the small plant will find it more economical either to replace bad oil with new or have purification done elsewhere. It is not generally a field procedure. However, the oil in many large transformers is filtered in the field while the transformers are in use.

Non-flammable liquid-filled (Askarel-type) transformers are available. The non-flammable liquid is usually a mixture of certain chlorinated compounds of correct physical characteristics. Its use permits a less restrictive transformer location and arrangement. However, there are certain disadvantages. This liquid too must be kept free from water. In fact the presence of moisture can be of great importance.

Another method available to minimize the fire hazard is the use of the

Continued good service of transformers is dependent on well-planned and well-maintained installations.

dry-type transformer. This type is not new, as it has been well known in street railway substation applications for many years. The early type was air blast cooled and contained a combustible insulation (Class A). The modern type, however, is insulated with non-combustible materials (Class B) with a limited amount of combustible binder and impregnating material which represents a moderate fire hazard under sustained short circuit conditions. Installations with this also need fewer safeguards than for oil-filled transformers. This type of transformer is more susceptible to damage by lightning than the liquid-filled types and if installed in locations where exposure to lightning surges is severe, the lightning protection should be most carefully engineered.

Safe transformer installations, of course, should include safety from mechanical injury. This means they should be protected from above as well as around the sides. Yard installations may be subject to mechanical injury from trucks and yard operations such as the movement of girders, lumber, or pipes. Objects thrown from windows or dropped from cranes can cause cracked insulators or dead short circuits.

The means of extinguishing fires in transformers are rather specialized. Only safe types of extinguishers should be used.

Portable water spray nozzles approved by the Engineering Division of the Associated Factory Mutual Fire Insurance Companies are quite effective and safe for use around live electrical equipment at voltages up to 250,000 when used at a distance of 10 ft. Solid streams of water are unsafe unless directed from a sufficient distance so that the stream is completely broken up before reaching live conductors. Important oil insulated transformer installations should be protected with fixed extinguishing systems, manually or automatically operated, depending on the size or importance of the installation. Water spray is best. Carbon dioxide is particularly suited for vaults or enclosures where the gas can be confined in a strong concentration. Low pressure storage tanks of refrigerated carbon dioxide are available for large quantity discharge for outdoor installations.

For oil-cooled installations, the transformers should be supported on a concrete base with a curb 6 in high, the base to extend at least 3 ft beyond the transformers in all directions. The basin thus formed should be filled level with coarse crushed stone and drained through a trap to a sewer if permissible, or to a low area or other safe location. This will prevent fire in escaping oil from spreading over the curbed area. Small outdoor transformers may be mounted on poles in the yard, or on blank brick or concrete outside building walls between windows. In the latter case there should be no openings in the walls above or below the transformers. Adjacent windows should be preferably wired glass in steel frame.

The accompanying tables summarize protection rules. Table I applies to outdoor oil insulated transformers not exposing buildings or important structures and located; 1. Twenty-five feet or more away from buildings; 2. Adjacent to blank brick or concrete building walls; 3. On roofs of reinforced concrete buildings.

Table II applies to outdoor, oil insulated transformers exposing valuable property located: 1. Less than 25 ft away from plain glass in wood frame windows, combustible walls, eaves, and important structures susceptible to damage by oil fires; 2. On roofs of combustible buildings; 3. On roofs of non-combustible buildings but exposing monitors with glass sides or other roof structures.

Fire protection for oil filled transformers in vaults or transformer houses is similar to the protection recommended for outdoor installations in Table I, except that protection is applied for all transformers above 100 kva rather than 300 kva.

Table III. Protection for single-phase or three-phase oil-insulated transformers located in properly designed transformer houses or vaults

100 to 1000 kva. each	One to six transformers but not exceeding 3000 kva total capacity	2½ in. portable water spray nozzle and 2½ in. C.R.L. hose.
1001 to 2500 kva. each	One to six transformers but not exceeding 7500 kva total capacity	Permanently piped water spray or carbon dioxide — Manual Control and thermostatic alarm.
Above 2500 kva. each	One transformer	Permanently piped water spray or carbon dioxide — Manual Control and thermostatic alarm.
	Two to six transformers.	Permanently piped water spray or carbon dioxide — Automatic Control and automatic alarm.

Reconstructing and Maintaining

Plant Step Ladders

Points to consider in the selection and purchase of step ladders . . . Ladders which you already have may be made safe by application of sound construction and repair principles provided basic structure of ladder is sound . . . Details are given for procedure to follow in remodeling and repairing in order to build safety into the ladder . . . Complete remodeling and safety-proofing of the ladders in any plant will pay big dividends in increased worker safety . . . Reconstruction

By **LAWRENCE J. LANDERS**, Maintenance Engineer

THE BEST WAY to prevent accidental falls from ladders is to keep all ladders in safe condition and discard any that cannot be made safe. Just because a ladder is new does not guarantee its safe qualities. Some of the cheaper ladders sold widely are flimsily built of poor quality materials. And even the strongest ladder is likely to loosen after years of use.

In selecting a ladder, several things should be considered. It should be built of well seasoned, straight grained, splinter-free wood that is not too heavy. Each step should be recessed into the side members and braced with a tie rod, Fig. 1. The back legs should be well braced near the floor ends to prevent springing, Fig. 2. The folding spreader braces and the top hinges should be made of metal of substantial thickness and well secured, Fig. 3. The top board of the ladder should be attached in a solid and well supported manner, Fig. 4.

Before buying a ladder, open it fully on a level floor and see that the ladder sets level and does not wobble, does not twist out of shape when the top board is given a twisting force, and does not fold shut when a closing force is applied to the two legs on either side of the ladder. Make sure the folding spreader braces operate freely but not with excessive looseness, and check all rivets, bolts and other fastenings to see that none are defective.

Ladders that you already have may be made safe providing the wood parts are not cracked, split or broken, and are not splintery. Any minor splinters or rough edges should be planed smooth. If the steps are not supported by tie rods, as shown in Fig. 1, these should be provided.

Measure carefully the distance between the outside surfaces of the side members ⅛ in. below each step, excluding the top board. Add to these measurements the thickness of a washer and nut for each end of the tie rod, with 1/16 in. additional at each end for riveting. This will then be the total length of each of the tie rods.

Use 3/16 in. diameter steel rod and thread ½ in. of each end, as shown in Fig. 5. Each rod is bent slightly to accommodate a supporting

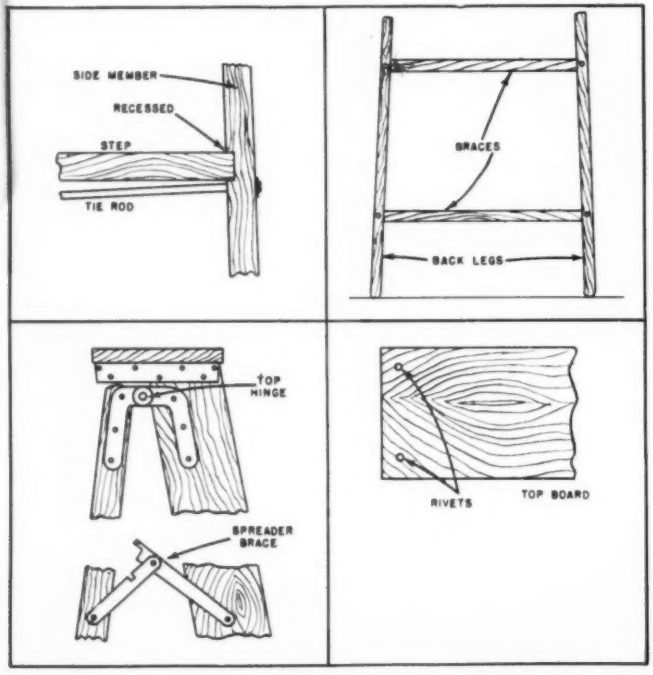


Fig. 1. How to recess each step into the side member and brace with a tie rod. Fig. 2. The back legs should be well braced near the floor to prevent springing. Fig. 3. Spreader braces and top hinges should be of substantial metal and well-secured. Fig. 4. The top board of the ladder should be attached and supported strongly

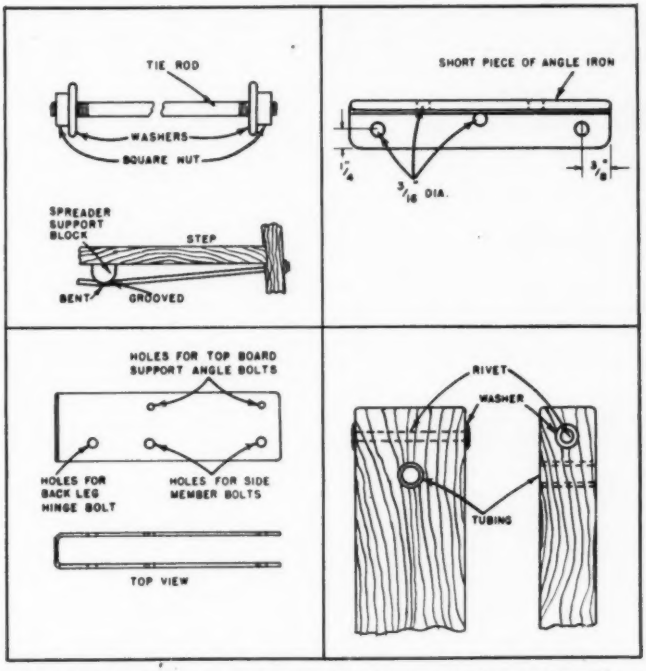


Fig. 5. How to thread and install the tie rod between the side members. Fig. 6. Shown in this sketch are the details of the angle iron bracing the end of the steps. Fig. 7. Duplicates of the hinge plates may be made by using other plates for templates. Fig. 8. Two lengths of small diameter pipe may be pressed into two holes at the hinge ends of the back legs

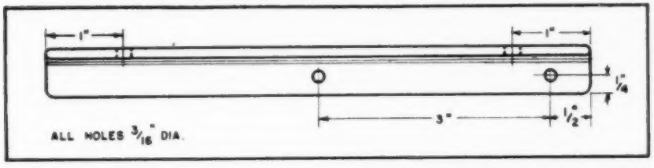


Fig. 9. Angle irons like these will provide a firm support for the top boards

spreader block that braces the center of the step. The nuts should be drawn tight with a wrench and the rod ends then riveted.

If the steps are attached to the side members with nails, remove these and substitute No. 8 round head blued wood screws. The screws should be ½ in. longer than the thickness of the side members and a hole of the same diameter as the screw shank should be drilled through the side member for each screw.

The addition of a short length 5/8 in. width angle iron to support each end of each of the steps will help prevent splitting of the steps and will give the ladder greater rigidity. The angle is bolted to both the step and the side member. The tie rod passes through a hole provided in the angle. Figure 6 gives details of the angle. Round head, 10/24 steel stove bolts or machine screws with square nuts should be used to fasten the angles to both the steps and the side members. Steel washers should be placed under the heads of the screws and the nuts drawn tight against the angles with a wrench. Rivet the screw ends slightly afterwards. This type of step support is helpful on any step ladder but is especially desirable on one having non-recessed steps.

Unless the ladder top board is supported securely and the top hinges are of sturdy construction, it is well to strengthen the ladder at this point. Remove the rivets fastening the hinge plates and use these plates as patterns to cut duplicates from sheet steel approximately 1/16 in. in thickness. These are made as shown in Fig. 7. Then attach the new hinge plates to the ladder in place of the old ones, using square head machine bolts, washers and square nuts instead of rivets. Be sure to rivet the bolt ends slightly after assembly.

Reconstruction Procedure

Cut two lengths of small diameter pipe or tubing and press them into two previously drilled holes at the hinge ends of the back legs, as shown in Fig. 8. The inside diameter of the tubing should just easily accommodate the hinge bolts. A rivet should be provided in each of the rear legs as shown to minimize splitting of the wood.

Next prepare two suitable lengths of 5/8 in. angle iron, as shown in Fig. 9 and bolt these securely to the top board and side members. These will provide a firm support for the top board and help prevent its splitting.

If the ladder is equipped with folding spreader braces discard these and substitute braces such as are shown in Fig. 3. These will hold the ladder more securely in open position. A pair of braces of this type may be constructed as shown in Fig. 11. They should be attached to the ladder with machine bolts as shown.

A ladder that is not substantially braced at the lower ends of the back legs should be braced as explained in Fig. 10. This will help prevent spreading and twisting of the legs.

If desired, a suitable box or tray may be attached to the ladder top board with wood screws, to hold tools or small parts when working from the ladder. This will prove convenient.

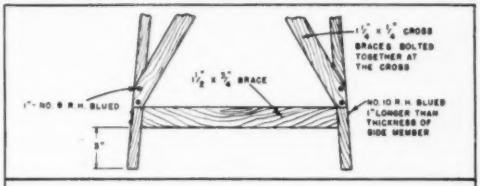


Fig. 10. How to make substantial braces for the lower ends of the back legs

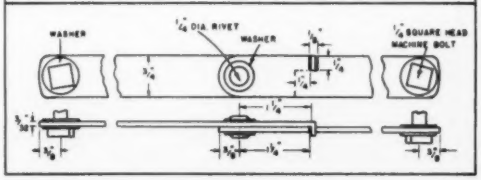


Fig. 11. How to make spreader braces for replacement use

Should Maintenance By Contract Be Encouraged?

II. The American Point of View

Outside service widely used in American industry . . . Contractor's costs higher but often advantageous . . . Local concerns favored . . . Differences in practice as influenced by plant size . . . Trouble spots . . . Costs as influenced by both time and money . . . Representative comments typical of four industries in four plants ranging from 100 to 4500 employees and located in four widespread sections of the country

VIEWED IN it's broad aspect as any repair or maintenance work done outside a company's own organization, maintenance by contract is well entrenched in American industry. To determine just how wide spread the practice is, reprints of the July article were distributed to a representative group of plant engineers in plants of all sizes distributed throughout the country.

Out of 61 plants, all but two now use some form of outside service. A break-down of the tabulated replies by plant size, and showing the type of outside service now used, is shown by Table I. Furthermore, if adequate service were available many more plants would follow this practice as indicated by Table II.

Assuming service on an equal basis the replies, by approximately a 3 to 1 choice, favored a local concern over company offering a national nation-wide service. Field investigation indicates that the most important factor in connection with outside service work is confidence in the concern. Much of this is emergency work for which the engineer is personally responsible. Before he lets this work out of his control he wants assurance that it will be handled promptly, completed on schedule, and accomplished properly. As in other lines, selling service is largely a matter of building confidence in the ability to perform.

While maintenance is not the only use for outside service, maintenance is a major problem of plant engineers. This is indicated by Table III, a tabulation of the plant engineering activities most troublesome in 50 plants. Roughly a third of the major problems are concerned with costs, budget and personnel or plant lay-out. The balance are concerned with some phase of maintenance, a large proportion of which involves production equipment and interdepartmental relationships.

It is obvious of course that every plant engineer would prefer to do all the work with his own organization. Speaking strictly of maintenance, for he uses other outside services, one engineer[1] comments "When the day arrives that an outside contractor can perform maintenance in my plant cheaper or better, I have lost my job."

Assuming equal quality, cost in time and money is the prime consideration. Few plant engineers however, feel that they must of necessity do the work themselves to protect their interests. Rather, as key members of the management staff, they have the direct responsibility for having the work done at the lowest overall cost.

Individually, the cost of outside work may be high for as one engineer[2] writes, "Work done by outside contractors generally costs 20 per cent more than work done by our own workmen." Another[3] says, "Outside service is used only when necessary. The dollar sign is the main reason for this because specialists cost too much."

Some maintenance work, does however involve special equipment, skills or large inventories of spare parts and tools which are not frequently used. Then again work sometimes piles up with several jobs at one time, too much for a regular crew to handle, but infrequently, so that it is not economical to build up a larger force or hire temporary help.

On an over-all basis the following comment[4] is pertinent, "It sometimes becomes necessary to use the services of outsiders . . . and . . . some of this type of work will always be necessary. Anyone who says that this work is not necessary cannot have considered costs."

As to methods most agree with the engineer[5] who writes " . . . prefer outside work done on a job order or contract basis rather than on a general maintenance contract." The type and size of plant is also important for as another[6] points out " . . . break the discussion down by size and type of plant. Obviously a large plant is more adequately staffed for diversified engineering problems than is a small plant."

Space does not permit a further discussion of this subject, but the following four comments cover in considerable detail viewpoints of individual engineers from four different industries, from four sections of the country and for plants ranging from approximately 100 to 4500 employees.

Contributed by R. W. Hastings, Plant Engineer, Shawinigan Resins Corp.

DEFINITELY maintenance by contract and all its ramifications are of interest to plant engineers. The decision as to the extent to which outside repair and maintenance services should be used economically is an ever-present decision influenced by factors of cost, company policy, size of the maintenance group and other local factors. Below the writer

Table I. Summary of various types of outside services used for maintenance and repair activities in 61 American plants. Figures show the percentage of the plants in each group using the particular service indicated

Group	1	2	3	4	5
Employees	100-500	500-1000	1001-2000	2001-6700	100-6700
No. of Plants in Group	11	22	19	9	61
Percent of Group Now Using The Following Service..					
Consulting Engineers	27	23	21	22	23
Building Construction	55	86	74	79	75
Inst. & Control Eq.	82	45	47	22	49
Motor Repair & Rewinding	91	91	79	89	87
Electric Control Eq.	45	18	16	—	20
Electronic Equipment	18	23	10	11	16
Return Eq. To Mfg.	82	86	63	100	82
Mfg. Serv. Dept. Supvn.	9	59	37	78	59

* Part I, The British point of view appeared on page 40 of the July 1949 issue.

[1] Arthur Twaddle, Plant Engineer, Pepperell Manufacturing Co., Mass.

[2] G. H. Kilbourne, Plant Engineer, Marion Power Shovel Co., Ohio.

[3] R. B. Heyward, Plant Engineer, The Duraloy Co., Penn.

[4] Henry Gorney, Plant Engineer, Standard Register Co., Ohio.

[5] M. H. Drinkwine, Plant Engineer, Corning Glass Works, Penn.

[6] Carl R. Toothaker, Plant Engineer, U. S. Rubber Co., Conn.

Table II. Outside maintenance and repair services that would be utilized if they were available. As in Table I the figures are expressed as a percentage of the number of plants represented in each group that would consider the use of specific services if satisfactory sources were available

Group	1	2	3	4	5
Employees	100-500	500-1000	1001-2000	2001-6700	100-6700
No. of Plants in Group	11	22	19	9	61
Percent of Group Who Would Use Following Services if Available					
Electric Motors	91	54	42	33	54
Elec. Control Eq.	45	18	16	11	21
Elec. Distribution System	36	9	16	11	16
Electronic Eq.	18	36	21	33	28
Inst. & Process Control	82	45	26	66	59
Heat Exchangers	—	14	5	11	8
Ground and Lawns	27	14	10	—	13
Boiler Plant	27	23	5	11	16
Parking Lots	9	14	5	—	6
Plant Protection	—	18	5	—	6
Automatic Eq.	54	28	10	33	26
Welding	18	14	5	11	11
Lab. Work & Sp. Tests	36	41	26	44	36

presents his views and opinions in connection with the plant engineer's work in a chemical process plant. As a starting point and to give a common basis of comparison the following assumptions are made:

1. Covers repairs and maintenance only, no new installations or processes.

2. The plant engineer is capable and will supervise the work whether done by his own or by outside service groups.

3. That competent outside service is available.

4. That the use of outside service is desirable.

Outside service could or should be used in the following general instances where local conditions dictate, as where:

1. Specialized engineering knowledge is required but not included in a specific plant engineer's group, i.e. architect, metallurgist (for corrosion problems, heat treating, etc.) or perhaps instrument or process control specialists.

2. Specialized mechanical skills are required infrequently, such as mason, expert rigger, special instrument repair man.

3. Specialized equipment not frequently used is required, for instance, heavy cranes, electronic balancing equipment or motor rewinding equipment.

4. Specialized repairs are infrequent and cost considerations do not warrant maintaining specialized personnel or equipment.

5. State or city regulations require licensed persons and the work is so infrequent as to make it inadvisable to maintain a regular own crew, for instance, elevator repairs, sanitary sewer facilities, etc.

In our particular situation, the following types of outside service are employed to best advantage:

1. Building repairs for masonry and concrete work, major roofing repairs and major painting jobs.

(Continued on page 48)

Table III. Summary of the most troublesome phase of plant engineering activities in 50 representative American plants, grouped into six general classifications. Words in parentheses indicate the type of industry

Group. 1. 100 to 500 employees	Group 2. 500 to 1000 employees	Group 3. 1001 to 2000 employees	Group 4. 2001 to 6700 employees
1. COSTS: Records and costs (soap).	1. COSTS: Keeping within the budget (machine tools); How to reduce costs (drugs).	1. COSTS: Paper work, cost accounting and budgeting (paper).	2. PERSONNEL: Development and training of supervisory personnel for the trades with definite promotional possibilities (rubber).
2. PERSONNEL: Obtaining competent skilled mechanics (cement); Mechanical skill of maintenance men (building materials); To secure capable help with an interest in something besides time-and-a-half pay and the clock (coal).	2. PERSONNEL: Getting proper personnel in the Maintenance Department for both supervisory and worker positions (hardware).	2. PERSONNEL: Human engineering and industrial relationships (soap).	4. PRODUCTION COORDINATION: Scheduling of equipment for inspection and repair in the face of 24 hr, 5 da week operation (paper); Fabricating special items for production departments during rush seasons (glass).
4. PRODUCTION COORDINATION: Installing new equipment with a minimum of down time in departments (insulation).	3. PLANT LAY-OUT: Planning, maintenance and construction (hardware); Plant lay-out (tobacco); Plant lay-out and equipment arrangement (metal products).	3. PLANT LAY-OUT: Technical design problems and lay-out (light machinery).	5. UTILITIES: Power lines, welding equipment and small portable tools (steel).
5. UTILITIES: Power transmission and electric controls equipment (metal).	4. PRODUCTION COORDINATION: Getting production departments to cooperate on a preventive maintenance program (machinery); Machine tool up-keep (boiler manufacturer); Keeping old equipment in operating condition with a minimum of down time (machinery); New production methods and equipment arrangement (automotive); Maintenance of automatic machinery using complicated electronic units (electronics); Coordinating various production, planning, routing, and methods departments to adhere to schedules previously agreed upon (light machinery).	4. PRODUCTION COORDINATION: Design and scheduling of replacement improvements (chemical); Automatic and electronic equipment (furniture); Machine break-downs (wood-working); Repair of die-casting machines (automotive); Changes to old equipment to increase production and improve quality (paper); Planning and designing new equipment (paper).	6. MISCELLANEOUS: Maintenance of freight elevator gates and miscellaneous elevator equipment (glass); Maintaining proper working conditions, i.e. the heating, ventilating, removal of dusts, and fumes from working areas (heavy machinery); General maintenance to keep the plant operating (packing plant).
6. MISCELLANEOUS: Air Conditioning (radio); Maintenance of piping, tanks, and other equipment due to the corrosive nature of material handled (citrus fruit); Record mould maintenance (radio).	5. UTILITIES: Maintenance of electrical equipment on important services such as air conditioning and air compressors (textile); Maintenance and continuous operation of electrical motors and controls (rubber); Control and operation of two 600 hp boilers where we have need of only about 150 hp (automotive); Boiler plant operation and maintenance (leather).	5. UTILITIES: Boiler house operation (manufacturing); Steam and air supply and control (glass); Power house operation (automotive); Electrical equipment and controls (manufacturing).	
	6. MISCELLANEOUS: Crane maintenance (foundry); Machine maintenance and repair (heavy machinery).	6. MISCELLANEOUS: Clean up and housekeeping (powder); Preventive maintenance (machinery).	

Avoid STREAM POLLUTION and Do It Cheaply!

This company found it had sufficient spare equipment, brains and ingenuity, along with help from experts, to neutralize its industrial wastes without huge expenditures of money for new equipment . . . Minor changes in plant procedure and processes brought results

PLANT ENGINEERS faced with the task of "cleaning up" waste waters to avoid pollution of public streams need not assume that the job will be costly. Many of these industrial executives, by instituting plant-wide housekeeping improvements and by full use of existing plant equipment, have proved that pollution abatement can be effective without a major outlay of funds or interruption of operating schedules.

An example of efficient handling of a complex waste disposal problem is the plant-wide program currently underway at the Jeannette, Pa. plant of Elliott Company. The contaminants that required disposal are several—all common to such operations. They include soluble and lubricating oils, waste pickle liquor and rinse water, and cyaniding quench waters.

It was apparent from the outset that each would require individual handling; yet a plant survey by Hall Laboratories, Pittsburgh consultants on industrial water problems, showed that careful planning and a modest expenditure of money would enable the company to meet its own local good-citizenship requirements in preventing contamination of near-by Bushy Run, which receives the plant's two waste water flows.

First offender dealt with in the program, which is now nearing completion, was soluble and lubricating oils. It was determined that these oils—mainly from compressors, steam turbines, and the gear boxes of production machine tools, and spoiled coolants used by production and precision machine tools—were being permitted by shop workers to pass into floor drains leading to the plant sewers. Accordingly, drip receivers were installed, and the oily waste thus collected now is dumped on the coal stockpile. A skim baffle was installed on the spray pond. A third step was the shaping of an earthen basin at the sewer outfall to act as an oil trap in case of accidental oil spills. Finally, provision was made in the plant maintenance work schedule for separate collection of waste soluble oils and disposal of this material on the coal stockpile.

Waste pickle liquors are neutralized in the pickle tank by periodic addition of alkali, with sludge disposal in a lagoon on plant property near-by.

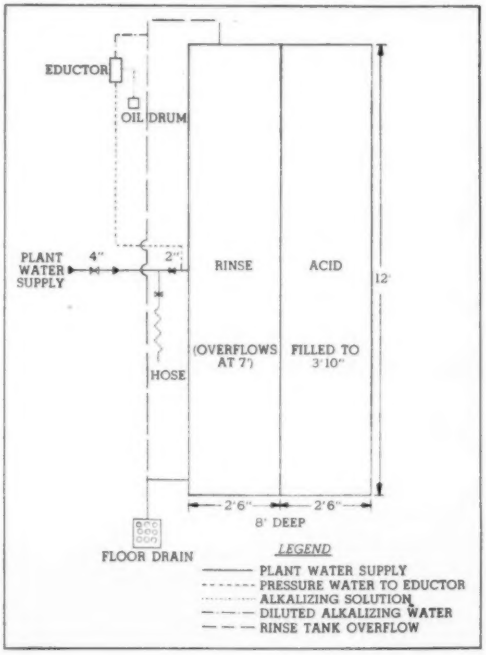
Two underground oil storage tanks, no longer used for their original purpose because of a recent change in fuel, made possible the economical disposal of rinse water. The water is automatically neutralized during operation, and piped to the tanks. One tank has been adapted for sedimentation and withdrawal of neutralized rinse water through a swing pipe; the other tank is used for concentration and storage of sludge produced by the neutralization of the rinse water. Each morning the swing pipe skims off the supernatant (clear liquid) which then is disposed of in the plant sewerage system.

To accomplish neutralization of rinse water, a branch line was installed between the inlet valve and the tank. An eductor is in this branch line, which feeds alkali to the rinse tank discharge. Thus whenever the inlet valve of the rinse tank is open, alkali is automatically fed to neutralize acid drag-out.

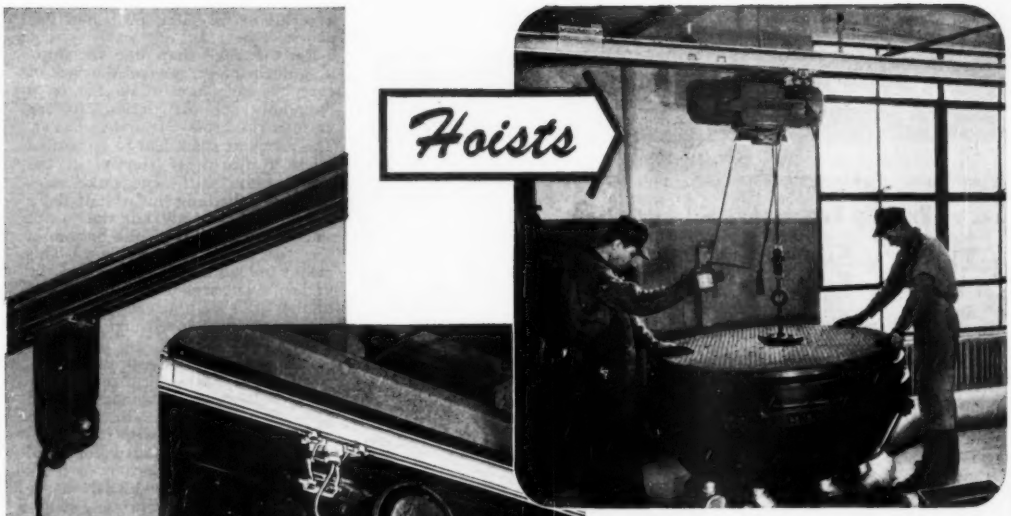
Care in rinsing and segregation of cyanide rinse water, and separate disposal, proved to be a different problem but not costly or difficult. Formerly, small parts of turbine governors were dipped in cyanide salt baths, and quenched with continuous runover. Normal volume of this operation was about 200 pieces per month. When it was found that the continuous overflow was contaminating the main body of plant waste water (which averages about 300 gpm) it was decided to switch from continuous rinse to batch rinse. This in turn made possible the minimization and segregation of this noxious waste, with separate disposal. Total waste thus disposed of averages about five gallons per day, six days per month.

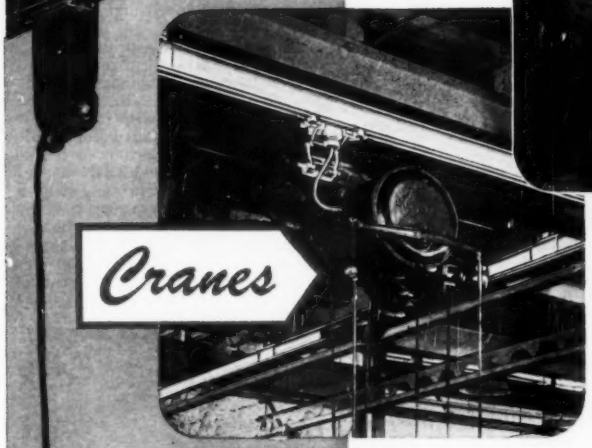
Finally, it was determined that sodium dichromate, which was formerly employed to prevent corrosion in cooling water circuits on the dynamometer stands, was having a toxic effect on the plant waste water. Accordingly a non-toxic material, Calgon was substituted.

Through these changes in operation procedure and by employment of available facilities in the plant, the management reported, major expenditures for oil separation, waste liquor neutralization and cyanide treatment facilities were avoided.



This drawing shows, schematically, how Elliott Company laid out an alkali feed system to neutralize acid drag-out in its rinse water





WITH FEEDRAIL *in*

are out!

Shut-downs due to faulty wiring and connectors disappear when the totally enclosed Electric Feedrail Distribution System is installed. You don't have to wait even for rewiring when you relocate electrical equipment in your plant.

Hand tools on the production line are connected to the Feedrail trolley in a jiffy and the problem of moving test lines, bench-work, and moveable lights, is solved for all time.

Feedrail is approved by the Underwriters' Laboratories Inc., and endorsed by leading mechanical, electrical and industrial engineers. Can be installed by your electrician or contractor in a few days.

Ask for the New Feedrail Catalog No. 20—thirty-two pages—more than 100 illustrations—layout diagrams and specification data. Write for yours to-day.

24

ELECTRIC FEEDRAIL

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N. Y.

Maintenance and Operation

Machinery, Equipment Map and Forms Simplify Tool Finding

Contributed by
Fred G. Hess, Asst. Pl. E.

IT IS THE plant engineer's responsibility to keep abreast of tool relocation and replacement. Our plant, the Camden Forge Co., Camden, N. J., has devised a machinery location map and accompanying equipment sheets. These provide an invaluable index of nearly 1,000 pieces of tools and equipment.

The 42 in. by 28 in. map shows building and property lines, building columns and layout of equipment, tools and machinery. Each building on the 30.7 acre plot is numbered; so is each building column. Equipment, tools and machinery are numbered according to a system originated by the Chief Engineer and are grouped as follows:

Group 1. No. 1 to 19—Hammers and presses.

Group 2. No. 20 to 49—Small Lathes, Grinders and Millers.

Group 3. No. 50 to 199—Saws, Planers and Slotters.

Group 4. No. 200 to 349—Large Lathes and Heavy Machine Tools.

Group 5. No. 350 to 499—Cranes, Hoists and Transportation.

Group 6. No. 500 to 649—Power, Blowing and Pumping Equipment.

Group 7. No. 650 to 749—Furnaces.

Group 8. No. 750 to 799—Laboratory Apparatus.

Group 9. No. 800 to 899—Miscellaneous.

Equipment listings under these nine groups comprise some fifty pages, each 8½ by 11 in., in ruled columnar order. Each sheet gives the following information about the tool or equipment concerned: Number and name; size and capacity; builder; builder's (serial) number; date purchased; building location; kind of drive; motor, horsepower and speed. In addition there is a "remarks" column in which can be noted any special characteristics.

Revised machinery location maps, which can be prominently displayed, and loose-leaf bound equipment sheets have recently been issued to key department heads and they serve as invaluable references for foremen, timekeepers, cost clerks, maintenance helps and mechanics.

GROUP NO.2
SMALL LATHES, GRINDERS, AND MILLERS

NO.	NAME	SIZE	CAPACITY	BUILDER	BLDR NO.	DATE PURCH.	BLG.	DRIVE	MOTOR HP	MOTOR SPEED	REMARKS
25	LATHE	24"	17"x18"	LODGE SHIPLEY	2316	9/33	20	DIRECT	10	850	
26	LATHE	6"	6"x1'	PORTER CABLE	1588		20	BELT			LINE SHAFT
27A	GRINDER	¾"		DUMORE	B393	1/40	20	DIRECT	1/10	22000	TOOL ROOM
27B	GRINDER	¾"		DUMORE	B113	2/43	20	DIRECT	1/10	22000	TOOL ROOM

A portion of a representative page from Camden Forge Co's. equipment listing manual

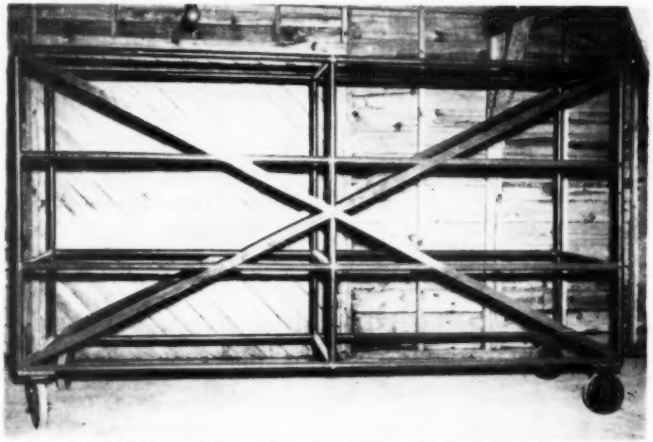
Lumber Carryall Ends Shop Congestion

Contributed by
Myron C. Ziemke

PRACTICALLY all woodworking production shops are so arranged as to have the supply of stock close at hand, probably just the other side of a fire resistant wall closed off with a series of fuse-link protected fire doors.

For the small shop, like our shipping department, we had the task of carrying each item of lumber on a flat dolly for distribution to the various rip, cross-cut or band saws. The remnant stock had to be hauled back to fire-proof storage at the close of the shift. The stake sides permitted hauling in a half-day's supply on the dolly but the job of selecting a piece from the bottom of the "deck" was a problem. This meant unloading the carrier and the undesirable spreading about of the lumber in a shop already congested with men, machinery and goods in transit.

The answer to the problem was worked out in the form of a grandiose dolly with a compartmented body constructed of 2-in. pipe, arc welded at the joints with four diagonal brace straps added for final rigidity. At the bottom corners triangular gussetts welded-in serve the dual purpose of improving structural rigidity and supplying a base on which to mount the 8 in. rubber-tired casters. These are ball-bearing with one pair designed to swivel for ease in maneuvering in congested aisles.

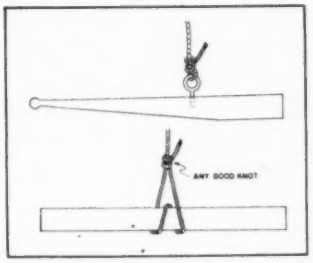


A few pieces of pipe and some strap iron, along with four rubber-tired casters and a job of welding made this lumber carryall possible

Easily-Made Ram For Heavy Driving

Contributed by
H. B. McDermid

EVEN TODAY, rams are often useful for driving into place some machine parts which are so bulky that the ordinary electric or pneumatic hammer fails. I once worked in a shop which produced prime movers of the old, slow-speed type which were so heavily constructed that the keys which held the shafts in place were 4 in. by 6 in. in cross section.



The top sketch shows the ram, described by the author, which was used for driving home heavy keys on prime mover shafts. The bottom sketch depicts one way of rigging up an emergency ram

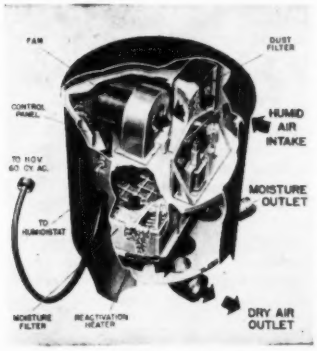
The job of driving one of these keys really was a problem until we rigged up the ram shown in the sketch. The ram itself consisted of a 12 in. steel shaft forged at one end to form a tapered handle about 3 in. in diameter at the small end. When the balance point had been carefully determined and an eye bolt had been tapped in the ram was ready for use. It could be picked up by a crane and, while its weight was approximately 1 ton it was an easy job for a crew of six men to manipulate it. It would not pay many shops to have a ram of this type but there are still many uses for rams of smaller dimension.

To make a simple type of ram just hang up a piece of scrap iron, round or square, with a piece of supporting rope as long as the room available will permit, and start pounding. I have even strung up heavy railroad ties and gotten good service.

Tiny Fans Prevent Corrosion

Contributed by
Westinghouse Elec. Corp.

THOUSANDS OF tiny fans are serving as the lungs of many ships in the Navy's "Mothball Fleet." These 3-in. blowers, made by Sturtevant Division of Westinghouse, circulate air in each sealed-off compartment through silica jell, a dehumidifying material, until the air's humidity has been reduced to 30 per cent or less. This point is low enough to prevent corrosion. Perhaps the method will find application in industrial plants ashore.



This minute assembly, multiplied thousands of times, is what keeps the "Mothball Fleet" of Navy ships from corroding

Water Repellent Film Aids Laboratory Work

Contributed by
General Electric Co.

AN INVISIBLE coating of water repellent has reduced an eight-hour dishwashing chore to a few minutes of rinsing at the U. S. Rubber Co's. Naugatuck, Conn. laboratories, where production samples of sticky latex are daily drawn off into hundreds of small glass dishes for quality analysis.

U. S. Rubber Company chemists said that the silicone water repellent is the best material yet found by them to prevent the adherence of latex to glass. One laboratory employee who formerly spent a full day scrubbing petri dishes with abrasives now cleanses them quickly and economically with running water.

Easily applied, this water repellent, called Dri-Film is thinned to a ten per cent solution before being poured into the dish. After the excess is drained off, the container is dried in a 200 F circulating oven for 15 min. Dishes so treated can be used and cleaned five times before another application is required.

Questions and Answers

Re: Heat Exchanger Costs

Submitted by M. H. R., Evanston, Ill.

WITH REFERENCE to the article in the April issue, "Heat Exchanger Costs, Selection and Maintenance," by A. Levine: Except for the possibility of better sealing between the tube side and shell side fluids, what is the advantage of the full floating head over the internal floating head shown by Fig. 2? And for that matter, the floating return sheet with a welded fixed tube sheet, as shown by Fig. 9?

Contributed by A. Levine

THERE IS NO such thing as advantage or disadvantage in the different types of heat exchangers. Each type has its own application. In a liquid-to-liquid exchanger, where a close fit is required between the shell and tube bundle so that the by-passing of the fluid around the bundle is a minimum, the split ring full floating head type is better adapted than the internal floating head. The split ring is used because it is the only way to use a small outside diameter floating tube sheet and still seal the tube side fluid in the floating head.

The floating return sheet with welded fixed tube sheet unit is used for long exchangers operating on large temperature differences and where the shell side fluid is nonfouling. This is a method of allowing the use of a non-removable bundle with large differential expansion between the shell and tubes.

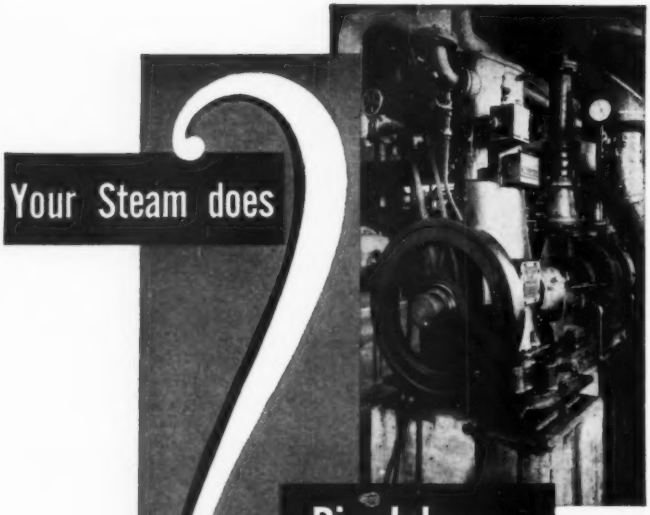
The welded tube sheet refers to the shell welded to the tube sheet. Many heat exchangers are built with tubes soldered or welded to the tube sheet. Soldering is mainly used in very small units to reduce the cost of manufacture to such an extent that it is cheaper to replace the old unit than to try to replace tubes or repair it. You will find these units used for small jacket and lube oil coolers on small Diesel engines and similar applications. Welded tubes are used where it is absolutely necessary that the material from one side of the exchanger does not leak to the material on the other side. An illustration of this is in illuminating gas manufacturing where, before the gas is pumped through the lines, it is cooled in a shell-and-tube exchanger, which in most cases is rather large, using 2 or 3 in. tubes. In such a case there is no fouling or corrosion involved because the cooling water usually is fresh water. The tubes can, therefore, be welded to the tube sheet and no cleaning or dismantling is required for the life of the exchanger.

Detecting Ammonia Leakage

Submitted by
M.M.N., Salt Lake City

LAST WEEK we had considerable trouble with ammonia leakage in the brine system of our refrigeration installation. Can you tell us if there is a quick, sure way of determining when such leakage is occurring? It took us quite a while to realize there was a leak because the ammonia was being dissolved in the brine.

WHEN THE AMMONIA leaks into brine or water with the leak submerged, the leak can be discovered by the use of a suitable reagent. Litmus paper is fairly reliable although a more satisfactory method is that of adding a few drops of Nessler's solution to a sample of the water or brine. When ammonia is present the



With proper plant heat balance your steam may do two big jobs. If you generate steam for processing or heating a Troy-Engberg Steam Engine can produce By-Product Power at a very low cost. The same steam then yields power as well as heat units!

It's the simplest story in the plant. Steam is first passed through the engine — driving pumps, stokers, compressors, blowers or generators. Then the exhaust, with most of the original heat units still intact, is used for processing or heating. And for dependability nothing beats the standard counterflow steam engine . . . no interruptions from power failure.

TROY ENGINE & MACHINE COMPANY
(Established 1870)
80 **Railroad Avenue** **Troy, Pennsylvania**

TROY-ENGBERG
ENGINES - GENERATING SETS - GENERATORS

water or brine will turn a faint yellow color. When large quantities are present a reddish brown precipitate will be found. Calcium brine should be treated with sodium bicarbonate before the solution is added.

Nessler's solution can be purchased already made up or it can be mixed as follows: Dissolve 17 gr of mercuric chloride in 300 cc of distilled water; then dissolve 35 gr of potassium iodide in 100 cc of distilled water. Add some of the mercuric chloride solution to the potassium iodide stirring constantly until a slight permanent red precipitate is formed. Then dissolve 120 gr of potassium hydrate in 200 cc of water, allow to cool and then add to the potassium iodide solution with sufficient water to make one liter. Add more mercuric chloride solution until a permanent precipitate again forms. Allow to stand until settled and decant the clear solution for use. Put in a glass-stoppered BLUE bottle and keep in a dark place.

Should Maintenance by Contract be Encouraged?

(Continued from page 43)

Minor roof repairs and painting are done by our own crew.

2. Heavy rigging jobs, requiring large cranes, heavy tackle and men experienced in this work.

3. Truck repairs for three trucks and which require specialized equipment and materials so that outside service is cheaper.

4. Electric repairs to primary 5500 v equipment only. All other electric repairs (except No. 6 below) are done by our own group.

5. Instrument repair for pneumatic controllers and recorders for temperature, pressure, flow, etc. We are now, however, training our own man as we have demonstrated that with experience we will have quicker service, equally satisfactory in 95 per cent of the repairs required, and at a lower cost.

6. Electric motor and transformer rewinding only. Bearing and mechanical repairs are done in our own shop.

7. Snow removal from plant roads and parking area.

8. Elevator repairs because a licensed repair man is required by state law and we have far too little work to maintain our own crew.

9. Sanitary sewer repairs or revisions for the same reason as No. 8 above.

10. Factory service men for highly specialized equipment such as continuous centrifugals, bag stitching machines, scales, etc. and then only for major repairs or overhauls. Minor repairs are done by our own shop.

11. Office equipment such as typewriters, calculators, payroll machines, teletype and telephone equip-

UNIT HEATING...
its uses and advantages

Where it is used Unit heating is widely used in industrial plants and warehouses, garages, stores and public buildings where the following advantages are important.

Low first cost Unit heaters are so efficient and so compact that their heating capacity is often equivalent to the capacity of cast iron radiation or pipe coils of twice the cost. Additional savings are effected because the system requires a proportionately smaller amount of pipe, fittings and accessories.

Economy of operation Heat is forced down to the working level . . . not banked uselessly at the ceiling level. Heat is turned on and off merely by throwing a switch either manually or automatically by simple thermostatic controls. The rapid response means that heat is furnished only when and where it is wanted . . . no heat is wasted.

Heating comfort Unit heaters provide quick heating from a cold start. Desired temperatures are easily maintained within a close range. Heat is uniformly distributed in the working zone by forced air circulation. It is a very flexible system because different or changing heating requirements are easily satisfied by means of different models, a range of capacities, single- or two-speed motors and individual thermostatic controls.

Adaptability to equipment and floor layout The units and the simple piping are overhead where they do not interfere with arrangement of operating machinery or equipment and do not take up valuable floor or wall space. Units are easily relocated at any time to meet changes in plant layout or heating requirements.

Thermolier unit heaters have important construction advantages The design of Thermolier unit heaters is the product of Grinnell Company's ninety-nine years of heating experience. Those responsible for heating like Thermolier's durability, freedom from maintenance troubles and dependable operation. Typical of its construction features is the patented internal cooling leg which permits the use of a plain thermostatic trap, the simplest, least expensive kind of trap. For full details on Thermolier features, capacities and types, send for Thermolier Catalog.

THERMOLIER
Unit Heaters

99 YEARS PIPING

GRINNELL

Grinnell Company, Inc., Providence, Rhode Island. Branches: Atlanta • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston Long Beach • Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

WATER PUMP PLIERS
A slip-joint design permits four jaw adjustment... extra length handles give added leverage.
LINEMAN PLIERS with HANDLEGRIP
Powerfully built cutting pliers... shown with plastic insulating grips ... guaranteed shock protection against average voltage.
Vacuum Grip PLIERS
An Exclusive Snap-on Product
will far outlast ordinary brands!
1. Hammer forged from special high carbon Silco-Molybdenum alloy steel.
2. Hardened with liquid heat and oil tempered clear through—not surface hardening only. Joints locally tempered electrically.
3. Scientific design which distributes strain over entire tool assuring maximum strength.
4. Smooth, perfectly matched, easy riding precision machined joints.
5. Sharp, deep milled teeth giving intense gripping power.
6. Hand filed, perfectly aligned blades on all cutters.
7. Spring tempered Vacuum-Grip "Non-Slip" handles.
25 patterns. Available only through Snap-on's nationwide, direct-to-user tool service .... not at any hardware or mill supply stores.
HEAVY DUTY COMBINATION PLIERS
A popular favorite with automotive mechanics, combining powerful cutters with tremendous gripping strength.
DIAGONAL CUTTERS
Finest diagonal cutter made... hand filed, perfectly matched cutter jaws. Recommended for cotter pins and tough cutting jobs.
NEEDLE NOSE PLIERS
Despite the slender nose they are extremely rugged. Specially machined for wobble-free action.
Snap-on Tools
THE CHOICE OF BETTER MECHANICS
SNAP-ON TOOLS CORPORATION
8068-I 28th Avenue
Kenosha, Wisconsin

ment. Maintenance of this is part of the plant engineer's job, too.

In spite of the length of the list of outside service work, there is plenty of work to be done in our own shop with a total of 40 mechanics in all trades: millwright; machinist; pipe fitter; tinsmith; carpenter; electrician; welder; mechanic; etc. The total plant force is approximately 275. The repair budget is approximately $250,000 per year as compared with a machinery and equipment value of approximately $2.-500,000.

Outside service work is usually based on the following:

1. Bid basis, especially where work can be defined and described definitely and when several sources of service are available.

2. Cost plus basis where work is indefinite or subject to revision or extension after work starts.

3. Contract on yearly basis only for office equipment.

The writer does not feel that in our present plant, contract maintenance as such is necessary. However, outside services providing specialized skills and equipment are certainly a necessity on a job-to-job basis, a necessity from the point of view of cost reduction and the ability to render quick and efficient service in all the many phases of repair and maintenance work.

Again, very definitely, this outside service work must be done under the supervision of the plant engineer or an assistant engineer. This is essential for: good planning and coordination with our own shop group; the training and experience; and, inspection to assure adequate performance of the work.

Use of outside service does not detract from the plant engineer's importance as long as he maintains control of it, control meaning the extent, method and cost of outside services. This control should include the specification or selection of equipment, materials, and processes which no good plant engineer will leave to the discretion of a contractor.

Contributed by F. Bradley,
Plant Engineer, Forstmann Woolen Co.

MOST PLANT engineers are influenced in meeting their maintenance requirements by the type of set-up peculiar to their industry and their organization. Some repair machine parts only whereas others are set up with machine shop facilities to not only repair but to actually make new parts.

Electrical jobs falling in the category of motor repairs that can be effected without a great deal of special equipment are usually done by the individual electrical maintenance groups. However, motor rewinding, replacement of commutators on brush-shifting motors and other special repair jobs are usually contracted out to a firm specializing in

How Darling features prevent trouble and expense

GREATER SERVICE LIFE

EXPERIENCED valve users know that the value of a valve is not determined by its price tag but by its service life, reliability, and the amount of maintenance and down-time necessary to keep it in operation. To assure greater service, the following advantages are combined in Darling's unique Fully Revolving Double Disc Parallel Seat Gate Valves:

1. **Discs do not wear unevenly.** Free to revolve completely, the discs seat in a different position at each closing, thereby multiplying the effective life of both discs and body seats.
2. **Face-to-face contact seating.** In closing, the discs are directly opposite the seat faces before wedging action takes place. In opening, wedging pressure is fully released before *either* gate starts to rise.
3. **Automatic adjustment for body distortion.** Diagonal face of upper wedge is curved and lower wedge face is straight; both faces are transversely beveled, to equalize wedging pressure against discs and permit tight 360° seating despite any misalignment of seats.
4. **Destructive strong-arm methods unnecessary.** Above features entirely eliminate need to "jam" valves shut or "break" them open.
5. **Advanced metallurgy.** Unusually rigid control and advanced methods provide castings that are superior to ordinary castings in strength, density, pressure-resisting characteristics, and in resistance to abrasion and corrosion.

To obtain greater valve life and trouble-free performance, be sure to specify Darling Fully Revolving Double Disc Parallel Seat Gate Valves.

DARLING VALVE & MANUFACTURING CO.
WILLIAMSPORT 14, PA.

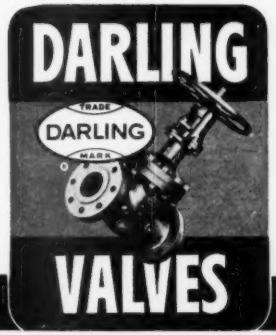
This advertisement is one of a series showing how the unique Darling Fully Revolving Double Disc Parallel Seat Gate Valves answer the following critical operating problems:

- *Positive, easy closing—regardless.*
- *Automatic adjustment for valve body distortion.*
- *Elimination of disc-to-seat friction and galling.*
- *Uniform wear distribution.*
- *Extreme simplicity.*
- *Greater service life.*
- *Simplified maintenance.*

CORROSION RESISTANT VALVES

In addition to conventional iron, bronze and steel constructions, Darling specializes in valves for any corrosive fluid: iron body valves with special alloy trim; iron body, rubber lined, with special alloy trim; all bronze; and all special alloy. Darling's 50 years of experience in meeting unusual requirements is always at your service.

Outline your service requirements and get complete *information on Darling Valves of the proper type. Or, send for the complete 300-page Darling Catalog No. 17M. It describes Darling Valves of* all *types for* every *normal or unusual service, and for pressures up to 1500 pounds. It's full of helpful information . . . Yours for the asking.*



THE VALVE MARK OF QUALITY . . . WATCH FOR IT

Stop the accident hazard that travels around!

A little oil slick on a factory floor . . . workmen walking through it on their way to the supply room or cafeteria.

Watch that floor hazard get around and cause accidents wherever it goes.

Sure, you can make floors safe. You can polish administrative floors to a high gloss with Legge floor polishes. They have reduced slips from slick floors up to 95%. And you can use Legge abrasive floor coatings and sprinkling compounds to slash the risk of grease-drenched plant floors.

But that's not always enough to stop a traveling hazard. That's why Legge Safety Engineers go further and set up a *master* floor safety plan. They develop plant-wide floor safety procedures to keep spillage in bounds. They teach your crews how to keep all floors slip-resistant, and how to do it safely and efficiently — in less time. They check results periodically . . . and head off most troubles before they start.

This safety service is free with Legge Safety floor products.

Learn how this service can work for you. For complete details, clip the coupon to your letterhead and mail. Walter G. Legge Co., Inc., New York 17, N. Y. Branch offices in principal cities.

Walter G. Legge Co. Inc.
101 Park Ave., New York 17, N. Y.
Without obligation, please send me complete details on the Legge System.

Signed_____

Title_____

Types of flooring_____

Area: _____ Sq. ft. PB-3

LEGGE SYSTEM
of Safety Floor Maintenance

Copyright 1949 by
Walter G. Legge Co., Inc., N. Y.

that type of work and equipped with the proper tools and machinery.

Based on my own experience, which parallels a great many plant engineers', we are required to do not only straight repair work of machinery and various mechanical and electrical services but also actually major work involving new construction.

This imposes on the plant engineering organization the need for a larger force than would be strictly necessary for straight repair operations. The volume of this construction type work influences the situation in a given case.

The plant engineer is responsible to his company for all work, whether performed by his own forces or by an outside contractor. Therefore, it is incumbent upon him to set down in sufficient detail the required specifications as to materials, services, design conditions and expected performance.

He may very profitably consider proposed substitutions as offered by various bidders and evaluate the economic results of the proposed substitutions. He will find it helpful to establish, wherever possible, standard specifications as well as make use of the various standards published by engineering societies and the ASTM specifications for materials.

Contributed by Robert F. Hastings, Plant Eng., Western Rock Wool Corp.

Good judgment is mandatory in determining where to draw the line in calling outside help for maintenance. In some large concerns a team of experts in all trades and a diversified engineering staff are necessary and pay for themselves. On the other hand, some small process industries can get by with a monthly inspection and repair period by having an outside service organization come in to get on top of trouble before it gets on top of management.

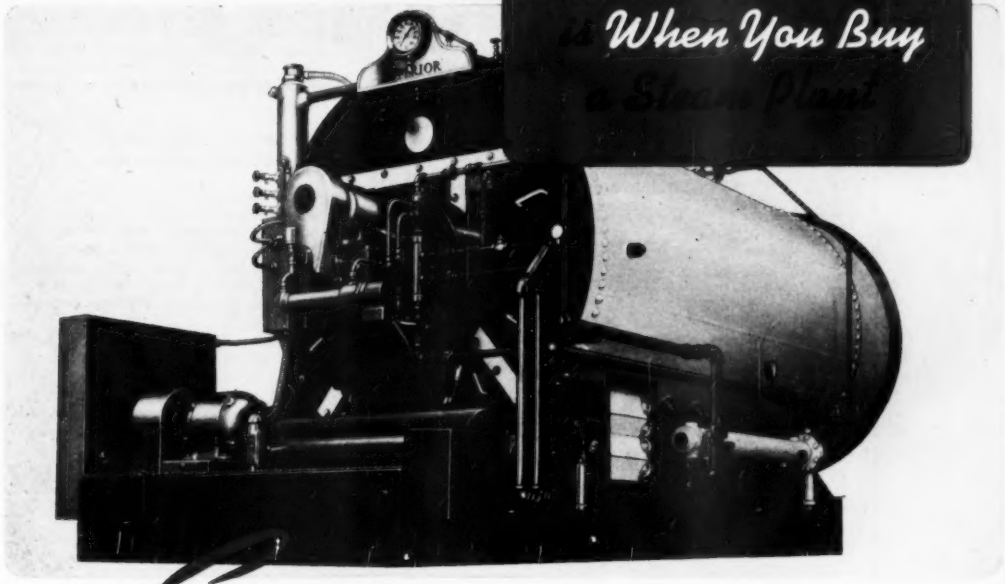
However, in this latter instance the plant engineer must be cautious, making sure his service organization does not use materials of higher quality than actually needed or replace parts with plenty of service life. If a job involves equipment unfamiliar to him he can usually find unbiased but objective articles on it in periodicals at his local library. A study of these plus contacts with at least two competitive suppliers of the equipment should enable the engineer to make decisions and deal intelligently with his service organization without being at its mercy.

Assuming both methods eliminate virtually all plant shutdowns the plant engineer should resort to his cost figures for his decision. After having outside help on several projects and knowing their cost, he should figure what the cost would have been to keep the various technicians of equal skill on his mainte-

The time to think of

OPERATING COSTS

is When You Buy a Steam Plant



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Not for today alone . . . nor for the next few months . . . but for **years** to come . . . your Superior Steam Generator will continue to generate low-cost steam at high efficiency. Based upon long years of combustion engineering experience, its design embodies features which assure maximum long-run economy; for power engineers are well aware of the fact that an inefficient boiler can waste more than its cost in a few years.

Its rugged, heavy-duty construction is visible evidence of its long-lived dependability; for Superior's greater weight per boiler horse power, and larger heating surfaces contribute measurably to long-run economy . . . assuring performance at capacity ratings year after year after year.

Unlike the car you drive . . . which you trade in for a new model every few years . . . steam generators should be built to give long years of satisfactory service. Make sure that the steam generator you buy has the features which insure both long life **and** economy.

Look for fully automatic operation with any grade of oil . . . or gas . . . for fully automatic operation is truly an economy. Look into Superior's built-in induced draft. Compare heating and evaporating surfaces. Compare both size and weight.

Then see a Superior installation and observe the little details . . . wiring, fittings, its own specially designed burner, and last of all, its sturdy construction.

You **can** see the difference, if you'll look. For complete details write for Catalog 105.

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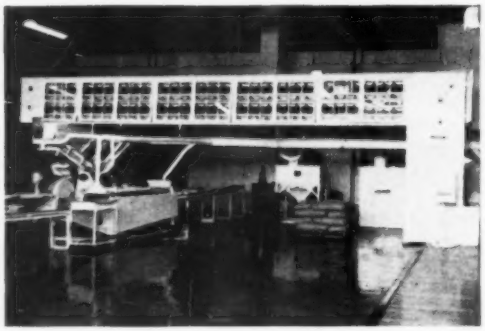
ROTO-CLONE
converts flour dust into "dough"



Bakery solves sanitation problem and reclaims 230 lbs. of flour daily

COMMERCIAL bakeries have a major maintenance problem. Air-borne flour dust coats equipment, floors and walls. Good sanitation practices dictate the removal of this dust immediately and it costs an average bakery plenty over a year's time.

And here's how a Phoenix, Ariz., bakery solved the problem. At rear and center of the bakery you see an AAF Type D ROTO-CLONE* and Airmat Arrester. The ROTO-CLONE removes the flour dust as it is released at the blender, rounder, proofer, molding unit and pan conveyor. The flour dust is collected in a hopper beneath the ROTO-CLONE and the air is then exhausted through the Airmat Arrester for final cleaning before being recirculated to the workroom.

Results—high sanitary standards maintained continuously at greatly reduced cost and 230 lbs. of flour (formerly a total loss) are reclaimed daily.

Dust is the enemy of all industry. Whether you make bread, chemicals, or castings, ROTO-CLONE dust control equipment can help you improve working standards and reduce maintenance costs. There's a size and type to solve every problem. For complete information, call your local AAF representative or write—

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nance and engineering team permanently.

He must also consider factors such as the inventory necessary, material handling, administrative cost of more employees, etc., and then decide which has the most financial advantage to his firm. Management is dollars and cents minded and the plant engineer must regard himself as a key man on the management staff.

Contributed by John Stearns,
Plant Engineer, Hughes Aircraft Co.

MAINTENANCE setups in aircraft companies vary with companies for each has problems peculiar to itself. There is one point in common, however, that of keeping the maintenance costs to a minimum. I am for any plan that will readily accomplish this.

In general the plan under which most companies in this area operate is as follows. The maintenance department is headed by a maintenance foreman reporting directly to the plant engineer. Under the maintenance foreman are a group of assistant foremen selected by trade: mechanical; electrical; carpenter; outside clean-up; runway; and janitor.

The disadvantage of this plan is the difficulty of keeping normal maintenance costs separate from construction maintenance. I believe that maximum efficiency can be attained in most plants by rearranging the work under an assistant foreman in charge of an area, rather than trade, and with a separate construction gang to take care of construction maintenance, such as department moves, partition changes, construction, or, rearrangement of buildings.

In each area, the assistant foreman would have charge of mechanical, electrical, and janitor employees. In this way, the cost of normal maintenance can be controlled and construction maintenance handled by a special gang. This concentrates the supervision in each area, reduces travel distance from one part of the plant to another and tends toward more efficient and better work, as well as, better control of costs.

There is little to be gained by contracting maintenance. A good plant engineer frequently finds it advisable to contract construction such as new buildings, or, to obtain outside assistance in the form of architectural, structural, or other engineering of a type for which he does not have a sufficient amount of work to justify carrying competent technicians on his own staff. In general, I am not in favor of contracting maintenance work to a professional maintenance company. In my opinion, it will not compare with the area method of organization and will not keep the cost of maintenance to a minimum.

D-C Power Costs Cut 20% Yearly!

Mr. R. H. Hill, chief electrical engineer at U. S. Arsenal, Watervliet, N. Y., makes a periodical inspection of G-E mercury-arc rectifier.

G-E rectifiers cut Arsenal's yearly maintenance and operating costs $3500

Mr. R. H. Hill, at the U. S. Government Arsenal, Watervliet, N. Y. is just one of the many forward-looking plant engineers who is cutting his plant's power bill with the new, modern way to get d-c power—by installing mercury-arc power rectifiers.

You can install these units, and then practically forget them. This means big savings in both maintenance and operating costs.

Mr. Hill, for example, says that installing a G-E 400-kw rectifier at the arsenal in 1943 reduced maintenance expense $500 a year. At the same time he reduced operating expense about $3000 a year, because he was able to transfer to other work the operators formerly needed. Total savings of $3500 represent a 20% cut in yearly d-c power costs.

TO CUT YOUR POWER COSTS

Find out today how you can cut your power bills by putting G-E mercury-arc power rectifiers to work in your plant. Call or write your nearest G-E sales office for information. *Apparatus Department, General Electric Company, Schenectady, N. Y.*

G-E Mercury-arc Rectifiers Mean Low-cost D-c Power

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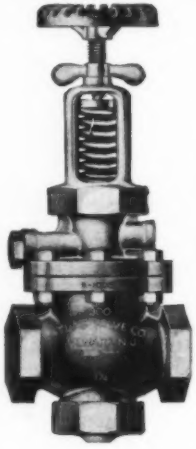
STEAM REDUCING VALVES

ATLAS Type "B" Steam Reducing Valves, shown below, are now STELLITED. The Pilot Valve is made entirely of that "WONDER METAL". And the Seat is STELLITE faced.

Type "B" is unequaled for services that require tight seating and uniform reduced pressure. With this remarkable STELLITED valve wide fluctuations in initial pressure have practically no effect on the reduced pressure because of the pilot operation. Renewable piston chamber, internal pilot valve and main valve strainers. Main valve disc seats tight because disc stem is guided by center bearing cast integral with seat ring. Control diaphragm and controlled pressure port are integral with the valve body. The main valve is caused to open wide and close tight with slight changes in the reduced pressure through the operation of the pilot.

This excellent valve is also simple to maintain. Main valve disc and pilot valve are easily removed for cleaning or regrinding. The entire pilot valve can be lifted out by merely removing diaphragm cap and unscrewing pilot valve seat.



For 250 lb. Service. Iron Body — Flanged Ends—Bronze or Nickel Alloy Seats and Valves—Pilot Operated. For initial working pressures from 20 to 250 lb. saturated steam: for reduced working pressures from 1 lb. to within 20 lb. of initial pressure in one stage. Sizes: 2½", 3", 4", 5", 6", 8".

For 350 lb. Service. All bronze — Screwed or Flanged Ends — Bronze or Nickel Alloy Seats and Valves — Pilot Operated. For initial working pressures from 25 to 300 lb. saturated steam: for reduced working pressures from 1 lb. to within 20 lb. of initial pressure in one stage. Sizes: ½", ¾", 1", 1¼", 1½", 2".

For 400 and 600 lb. Service with Temperature to 900° F.—Steel body. Monel Metal, Stainless Steel and Nitralloy Seats — Stainless Steel Piston and Piston Chamber—Flanged Ends —Pilot Operated. For reduced working pressures from 1 lb. to within 30 lb. of initial pressure in one stage. Designed and built to withstand severe corrosion and wearing service under high pressure and temperature conditions. Sizes: ½", ¾", 1", 1¼", 1½", 2", 3", 4", 6". Series 40 for steam service to 400 lb. Series 60 for steam service to 600 lb.

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- ☐ Damper Regulators
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- ☐ Exhaust Control Systems
- ☐ CAMPBELL Boiler Feed Water Regulators
- ☐ Pump Governors
- ☐ Pressure Regulators
- ☐ Oil Control Cocks
- ☐ Humidity Controllers
- ☐ Thermostats
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Bulletins on Current Plant Problems

(Continued from page 26)

switches have been tested and approved by Underwriters' Laboratories for a-c or d-c use, the bulletin states. Back cover provides information on capacities and ratings of the switches, applications for which they are suitable and a catalog listing of their characteristics. The Trumbull Electric Mfg. Co.

112 Answer Card—Rules of thumb for answering three questions concerning capacitors and for applying power-factor-improvement are printed on a double card small enough to fit in a plant engineer's wallet. With this card he can quickly compute the answers to the questions: How many kilovars? What power factor? How much voltage rise? Simplified diagrams illustrate the formula for quick computation of the answers to these questions. Apparatus Dept., General Electric Co.

113 Electric Control Devices — Eight-pp Bulletin 100.000 covers manufacturer's complete line of electric control devices for industrial control applications. It describes and illustrates rheostats, resistors, relays, motor starters, contactors, control accessories and dimmers. Along with each class of equipment listed is reference to company bulletin dealing specifically with that particular product. Ward Leonard Electric Co.

114 Electrical and Lubricating Devices—Four-pp Broadside 300-A presents 13 ways to step up production and cut maintenance costs. A complete, condensed catalog, it describes in detail manufacturer's line of fuses, fuse clip clamps, test clamps, fuse pullers and lubrication devices. Trico Fuse Mfg. Co.

115 D-C Brakes—Bulletin CR5927 (GEA-5194), 8 pp, introduces a two-shoe d-c brake for hoists, cranes, conveyors, steel mill drives and other services. Explains the brake's electrical and mechanical design features which provide for greater strength and protection, easier installation and maintenance. A large cutaway illustration is accompanied by brief descriptions of all parts. Lists dimensions, brake ratings of available models. Control Divs., General Electric Co.

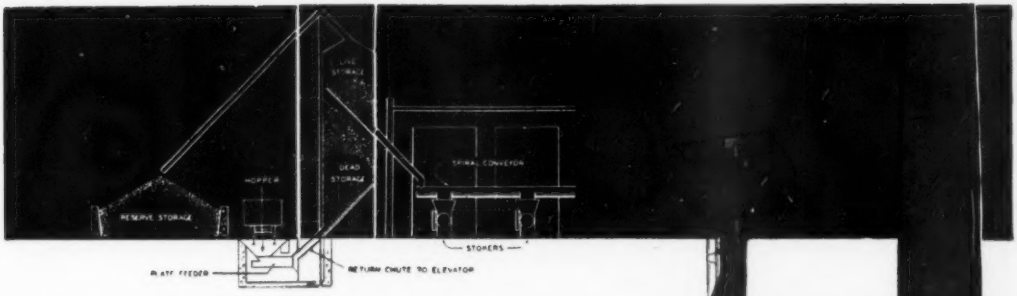
MATERIALS HANDLING

116 Slings as You Need Them—Covering 8 pp, Bulletin S-2 contains a "make your own" sling chart of considerable help in selecting wire rope slings to meet particular plant applications. It illustrates legs and accessories and shows how they can be utilized for various lifting jobs, telling equipment needed for each assembly, giving lengths and loop dimensions, and recommending cables and strands for different loads. Bulletin also discusses special features of manufacturer's cable-laid and strand-laid slings. Also available is a handy pocket-size card which gives factors for discarding wire rope slings, and safe capacities of strand-laid wire rope slings. Wire Rope Sling Dept., American Chain & Cable Co.

117 20 Questions — The answers to 20 questions on the why of pre-formed wire rope are given in this 8-pp pocket-size folder. They range from the meaning of the term pre-formed to the safety and performance advantages offered by this rope, and the ways in which it may be ordered and used. Macwhyte Co.

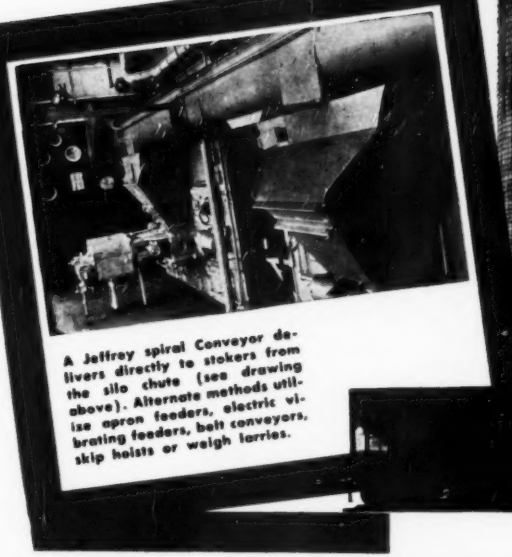
118 Portable Cranes—This 4-pp bulletin presents portable cranes for shipping, un-

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 36 and 37 and 44 and 45



ENCLOSED STORAGE WITH SPIRAL FEED

Here's another typical Jeffrey installation with the advantages of handling large capacities in minimum space. For this and other coal and ash handling economies our Power Plant equipment Catalog No. 778 will come in handy. Send for your copy TODAY.



A Jeffrey spiral Conveyor delivers directly to stokers from the silo chute (see drawing above). Alternate methods utilize apron feeders, electric vibrating feeders, belt conveyors, skip hoists or weigh larries.

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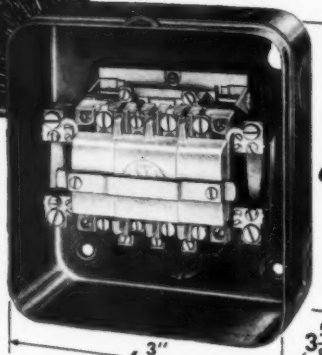
ESTABLISHED 1878

Complete Line of Material Handling, Processing and Mining Equipment

EASY
to Wire to Service

THE SMALLEST STARTER on the MARKET



ARROW AH HART

NEW "RA" SIZE 1

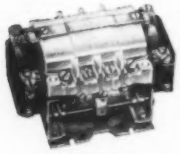
MAGNETIC STARTER!

Working electricians, installation and maintenance men find the design of the new A-H "RA" Magnetic Starter makes wiring easy. It's straight through — all the way — gives plenty of wiring room in the box and saves mounting space on installation.

Servicing is easy, too. All terminals and contacts can be reached quickly — with no loss of time or motion. Lots of performance is packed into this smallest starter enclosure — 6-3 16" x 6-11/16" x 3-5/8". It's easy to install the unit into small spaces for accessibility and convenience.

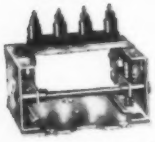
BIG, TOUGH CONTACTS

Rugged, heavy duty, copper contacts, with special silver alloy tips, take plenty of punishment. Special spring-loaded keys provide speedy and easy change when maintenance is necessary. No loose parts.



PLASKON ALKYD PROTECTION

New compound in starter base and hood gives 50 to 65% higher resistance to tracking than next best material. Provides hard, durable surface and superior dimensional stability. Gives you maximum performance, safety and long life in all A-H "RA" Magnetic Starters.



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Right angle *balanced* mechanism multiplies leverage — transfers it from a vertical to a horizontal plane. Increases contact pressure — reduces volt-ampere consumption. There's no extra load to lift because the right angle moving mechanism is *balanced*.

The new Type "RA" is available in sizes 0, 1, 2 and 3, to handle motors up to 50 H.P. at 440 and 550 volts.

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loading and stacking. Contains photos and brief descriptions of many models, giving their capacities, dimensions and applications. Specifications and prices furnished. Also describes and illustrates accessories for lifting and clamping materials. Grand Specialties Co.

119 Jacks of Many Jobs—Industrial lifting and lowering jobs and other applications of manufacturer's air motor power jacks are illustrated in 8-pp Bulletin Ad-11-249. It also includes a detailed explanation of the construction and safety features of these jacks, and separate sections are devoted to specific applications and over-all specifications of the 20-t, 50 t and 75 to 100-t capacity jacks. Duff-Norton Mfg. Co.

120 Conveyor Belts—Noteworthy for its illustrated case studies of successful installations is this 4-pp folder (Stock No. 5-7284G1) on conveyor belts designed for conveying materials at higher angles of incline without slipping. On these belts the material carried is gripped by projecting fingers—1000 to the sq ft—on the belt surface. The case studies show the belt being used to handle coal, boxes of freight, sacks of sugar, and even ice up a 7 per cent incline. The B. F. Goodrich Co.

121 Portable Conveyors—Eight-pp illustrated Catalog 495 covers lightweight, portable power conveyors for handling bulk materials and packaged goods. Included are photographs, application and specification data on bulk conveyors, package conveyors, combination conveyors and special machines. Emphasizes increased handling efficiency afforded by use of this equipment. Lake Shore Engineering Co.

122 Heavy Duty Casters—This 4-pp bulletin gives complete information about a new line of forged-steel precision type heavy-duty casters in 5-, 6- and 8-in. dia wheel sizes. Contains photographs of the forged-steel top plate, main load bearing and other parts. Illustrations and specifications are given for eight types of swivel and rigid casters. Bulletin also shows construction features of manufacturer's super heavy duty casters, both swivel and rigid. The Bassick Co.

123 Industrial Casters—Bulletin 60 is a 12-pp ordering guide for forged steel casters for regular, heavy, and extra heavy duty industrial applications. Photos illustrate many types of swivel and rigid casters. Specifications, dimensions, weights and prices are included. Also listed are rigid casters of plate steel. General information on casters and wheels is provided. The Hamilton Caster & Mfg. Co.

124 Utility Tractor—Bulletin 1322, 4 pp, discusses the economy and versatility of an all-purpose industrial tractor of 1050-lb draw pull capacity. Contains photos of some of its many applications. Includes specifications and dimensional diagram and illustrations of available types of hitches. The Buda Co.

125 Industrial Tires—This is a 26-pp handbook on solid rubber tires for industrial trucks, conforming to specifications of many truck manufacturers and sold through original truck manufacturers. Provides general information about these tires, discussing in detail the pressed-on type, giving sizes, carrying capacities and prices. Also describes and illustrates cured-on and cushion types. Gives tips on making tires wear longer and lists specifications for tires made for several truck manufacturers. The Monarch Rubber Co.

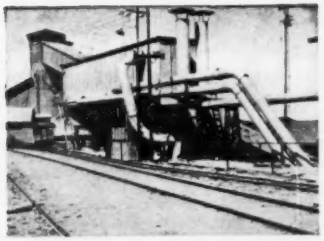
CONSTRUCTION MATERIALS

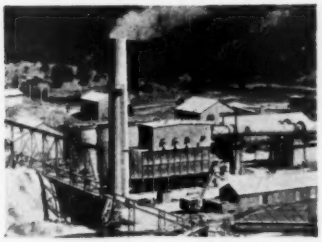
126 Industrial Buildings—Here's an 8-pp illustrated catalog describing manufacturer's design principle for economical rigid frame steel building construction. It explains how this rigid frame method affords speedy construction without a network of trusses. Special applications for industrial and other buildings, either conventional or eccentric in design, are discussed in full and illustrated with line drawings and photographs. McCloskey Co. of Pittsburgh.

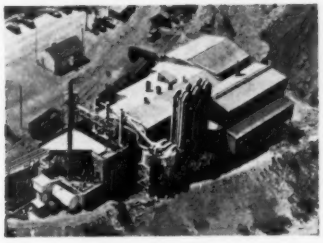
127 Glass Blocks for Industrial Buildings—Form G81700, a 40-pp handbook containing general and technical data, illustrations, construction details and specifica-

Norblo

AUTOMATIC
Bag Type
Dust Collection







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1. Basic unit compartment houses 78 cylindrical cloth bags — fully distended by upward inside air flow.

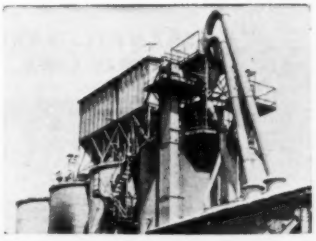
2. Shaking and cleaning involves only one compartment at a time, and only a few seconds out of each hour of operation.

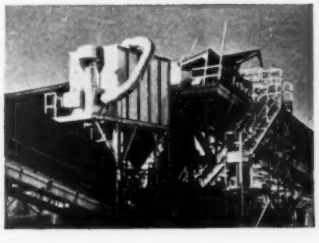
3. Variable timing of cleaning cycle according to dust load insures constant volume of air handled and of dust collected.

4. During shaking period air flow is reversed, loosening dust and accelerating its descent into the hopper.

5. Any compartment may be cut out of operation for repair (from the clean air side) with all other compartments continuing in operation. Adjustment of shaking timer for dust loading can be made in a few minutes without shutting down.

Norblo equipment is completely designed and fabricated in our own shops and sold on the basis of guaranteed performance. If you need dust collection for production, for salvage, for good housekeeping ask Norblo engineers what they can do for you. Let us send you Norblo Bulletin 162-4.





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Automatic and Standard Bag Type Fume and Dust Collectors
Norblo Centrifugal and Hydraulic Collectors
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A good strainer protects your equipment and pipelines. Yarway gives you a better strainer to "police your pipelines".
• FIRST—*The Screen* is a high-grade woven monel wire basket that catches solids, lets condensate, oil or other fluids flow freely. Perforated screens if desired.
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tions, is offered to qualified plant engineers. By dividing glass block patterns into decorative and functional groups and elaborating on the advantages of each, this book makes it easy to select the right pattern for the job requirements. It covers the use of glass blocks in industrial and public buildings, and as sash replacements, furnishing facts about functional glass blocks and illustrating available patterns. Technical data includes modular installation details, curved panel installation requirements and estimating data. Pittsburgh Corning Corp.

128 Industrial Flooring — Here's an informative 4-pp bulletin on a quality tile flooring, described as greaseproof, for industrial and commercial buildings. Contains full-color photos of 12 marbleized and plain shades, interesting photos of actual installations, architect's specifications and other information. Tile-Tex Div., The Flintkote Co.

ENGINES, PUMPS, COMPRESSORS

129 Engines and Power Units—Carburetor-type power units which burn gasoline or gas and provide up to 55 working horsepower are the subject of 12-pp Bulletin A-164-MM. It explains how these units may be adapted to provide power for mills, pumps and machines. A large cutaway illustration shows all working parts and is accompanied by detailed description. Four models (from 24 to 55 hp) are described separately and illustrated by photos. Specifications, dimensions included. Bulletin also lists useful attachments. Industrial Power Div., International Harvester Co.

130 Pumps for Paper Mills—This 8-pp bulletin is devoted to manufacturer's stock pumps for pulp and paper mills, illustrating and describing in detail the outstanding features of this equipment. Also discusses paper stock pipe friction and includes graphs showing friction loss in feet per 100 ft of cast iron paper, and the capacity of pulped stock in gallons per minute for various consistencies and tonnage. The Frederick Iron & Steel Co.

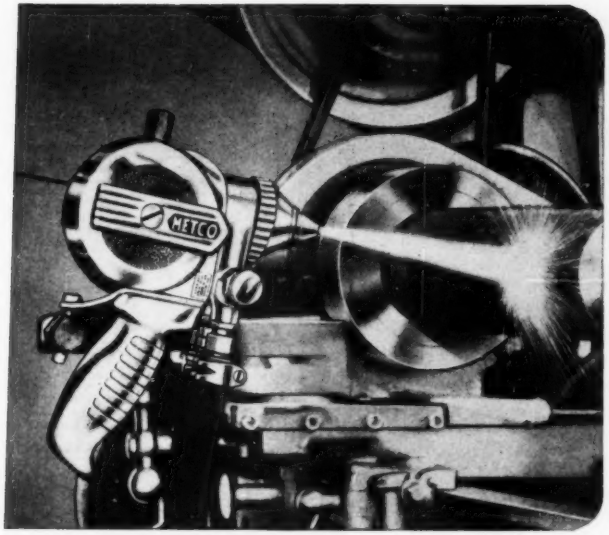
131 High Vacuum Apparatus — This 50-pp handbook, Bulletin 10A, covers vacuum pumps and accessories and furnishes excellent engineering data on planning high vacuum systems. Contains illustrations, specifications and dimensions for many types of vacuum pumps, gages, burners, lubricants and other accessories. Prices and ordering information included. Central Scientific Co.

132 Axial Flow Compressors—The design features, construction and operation of axial flow compressors for electric, steam or gas turbine drive are described and illustrated by photo and sectional drawings in Form No. CH-1148, 8 pp. Gives advantages of these compressors for large volume application. Clark Bros. Co., Inc.

EQUIPMENT INSTALLATION

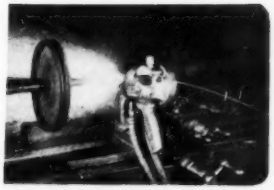
133 Economical Vibration Control—A low cost cork and rubber mounting requiring no bolting or cementing for most applications and providing an efficient means of controlling transmission of vibration and noise is described in Bulletin ER-701, 4 pp. Methods of installation are described and illustrated and the resiliency, damping factor and sound insulation qualities of this material are compared with those of other insulating materials. Three types of damper are also described in the bulletin which states that the greatest efficiency of this material is obtained in the recommended loading range of 750 to 5,000 lb per sq ft. Korfund Co., Inc.

134 Pack Hardening Paste—A paste specially developed for selective hardening is featured in this 4-pp bulletin, which also describes an isolating paste. Discusses the many advantages of the pack hardener,



now a really low-cost metallizing installation...

with the *new* Metco L-Gun



llizing damaged journals on turbine shaft

Building up worn brake-drum

etallizing protective coating on steel plate

New, low, compressed-air requirements . . . only 10 cfm at 40 to 60 psi, already available in many shops, or supplied by inexpensive 3 hp compressor . . . bring metallizing within reach of the small user.

Here's a chance for the smaller maintenance shop to get into profitable metallizing operations like these:

- Save up to 90% of replacement costs on machine repair jobs,
- Do your own hard-facing,
- Apply long-wearing corrosion-resistant coatings to exterior plant structures, tanks and other equipment.

Sprays 23 Different Metallizing Wires—With the new L-Gun you can spray .10, .25, .80 carbon steels, stainless; babbitts, brass, bronze; nickel, aluminum, tin, zinc; special hard-facing materials such as Metco-Weld H, and the new self-bonding spray wire, Spra' ond.

It's Versatile—Use the L-Gun machine-mounted or hand-held—it weighs only 4 lb. 2 oz. Do all kinds of metallizing work—shaft and bore build-up with harder, longer wearing metals; build up worn pump plungers, crankshafts, motor shafts; apply corrosion-resistant coatings. There are hundreds of different jobs that are "naturals" for metallizing.*

Same High Quality as Other Metco Guns—The low air requirements of the new L-Gun have been achieved without any sacrifice in Metco quality. It embodies new developments in turbine and nozzle construction—is built, like all Metco guns, for rugged, dependable service.

A Real Opportunity for the Smaller Shop—Thousands of large, well-known companies have been metallizing users for many years, not only in maintenance but in production applications on original equipment. Now, with the development of the new L-Gun, and a low cost installation, metallizing is within the reach of even the smallest plant. (We'll be glad to send you the names of some Metco users—large and small.)

Free Bulletin or Shop Demonstration—Send off the coupon for the detailed information Bulletin 55 gives you. Or, better still, ask for a demonstration in your own shop by a Metco Field Engineer. He'll be glad to show you how the new Metco L-Gun works on some job of your own. No obligation, of course.

***Where NOT To Use Metallizing**—Metallizing is a practical, low-cost method of performing literally hundreds of maintenance and production operations. Briefly, it can be used wherever metal build-up is desired—*except* 3 types of parts; those subject to *impact* (such as dies, punches); *point stress* (ball bearings); or *elongation* (gear teeth, threads). Use it anywhere else, but whenever in doubt just drop us a line.

following names are the property of Metallizing Engineering Co., Inc.—METCO†, Spraybond, Metco-Weld. †Reg. U. S. Pat. Off.

R. J. McWaters
Metallizing Engineering Co., Inc.
38-13 30th St., Long Island City 1, New York

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☐ Arrange a free demonstration in my shop:

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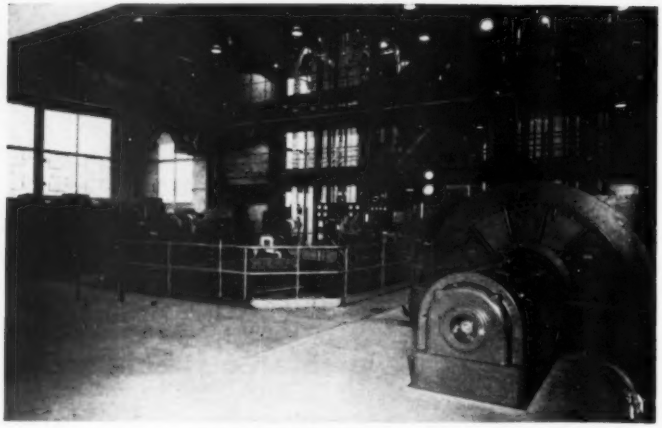
METALLIZING ENGINEERING CO., INC.
38-13 30TH STREET METCO LONG ISLAND CITY 1, N. Y.

Behind the scenes
is this modern turbine room



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LUBRICATING OIL FILTERING SYSTEMS
protect expensive equipment and reduce maintenance

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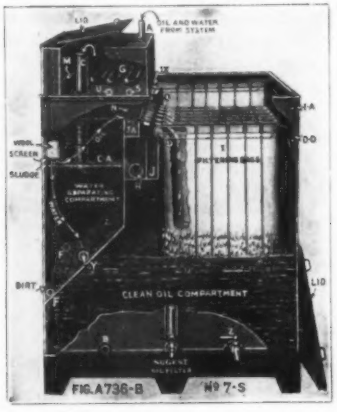

Nugent Gravity Oil Filters are available to meet every need. Write today for full details and descriptive literature.

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OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

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and explains and illustrates, by a series of photos, the easy steps by which it is used. Also tells how to use the isolating paste. Denfis Chemical Laboratories, Inc.

PAINTING, MAINTENANCE

135 Engineered Painting—What the right paint can accomplish in the way of increased production, accident reduction, improved morale and better housekeeping is presented to plant engineers in this attractively illustrated 26-pp book. Gives recommended levels of industrial illumination. Discusses the special advantages of white paint, and the use of color as a safety aid. Also tells how "engineered painting" can provide "paint on the wall" at lower cost. Includes suggestions for interior finishes. U. S. Gutta Percha Paint Co.

136 Color Compass—Called the Optonic Color Compass, this novel selection wheel is a handy aid for determining quickly the proper shades of paint to create better seeing conditions, greater plant safety, higher employee morale and more efficient plant housekeeping. Eight different color schemes are shown, two for each exposure. Also given are scientifically sound selections of colors for controlling light reflectance through application of specially formulated paints in rooms having a double exposure as well as areas where artificial lighting predominates. The Arco Co.

137 Maintenance Chart—Decidedly useful to a plant engineer is a good maintenance check chart like this. It takes up 3 pp and covers maintenance of floors, roofs, wood surfaces, masonry surfaces, insulation, sidewalks, driveways, and other indoor and outdoor areas, describing briefly the early signs of adverse conditions and listing, by number, products for combatting them. Back of chart gives names of products supplied. United Laboratories, Inc.

VALVES

138 Back Pressure Valves — Two back pressure valves—one for automatic evaporator pressure control and one for use with thermo-air relay for temperature control—are described and illustrated by photos and sectional drawings in 8-pp Bulletin 956. Contains capacity charts for ammonia and freon gas based on gage pressure and on absolute pressure. One page pictures several of manufacturer's other valves and regulators. A. W. Cash Co.

139 Regulating Valves—Bulletin 47-1, 23 pp, is intended to acquaint plant engineers with the merits of a valve design widely useful in process industries, paper mills, dye houses and tanneries. The operating principle of these single seat pilot balanced regulating valves is described fully and illustrated with schematic drawings and dimension charts. Contains information on the slip-stem and rotary shart types for steam, air and gas, and the slip-stem and rotary shaft types for liquids. Includes circumferences and areas of circles and flange dimension charts. Belfield Valve Div., Minneapolis-Honeywell Regulator Co.

140 Precision Parts — This is a 20-pp catalog describing manufacturer's precision parts for industrial manufacturers. Products pictured and described include many types of check valves, jet engine controls, on-off valves, angle needle and instrument vacuum control valves, engine primers, plug valves and a variety of flared tube, bulkhead, pipe thread and hose nipple fittings. Arranged for easy reference. Every part is shown with cutaway illustrations and accompanied by table of sizes and engineering data including connections, operating pressures, open pressures, rates of flow, pressure drop, material and weight. Kohler Co.

141 Solenoid Air Valves—Folder S, 4 pp, presents manufacturer's single and double

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 36 and 37 and 44 and 45

solenoid operated valves for air pressures of 0 to 125 psi, emphasizing new features of design and construction. Includes listing of available models, sizes and prices. Both single and double types are illustrated by photos. Valvair Corp.

LUBRICANTS, LUBRICATING DEVICES

142 Silicone Lubricants—"Silicone Notes No. 5 on Dow Corning Silicone Greases," 4 pp, gives properties, performance data and uses of these heat stable and oxidation resistant silicone lubricants. High temperature stability is demonstrated in a table of bleed and evaporation values for the silicone greases and various high temperature petroleum greases. A variety of tests data on the silicone greases is included. Dow Corning Corp.

143 Visual Oilers—This 8-pp booklet features company's latest line of visual oilers and contains endorsements from equipment manufacturers and maintenance engineers on specific applications, complete with photographs and diagrams. Examples include gravity feed, wick feed, constant level, vibrating rod and multiple oilers. Detailed catalog information is provided on every oiler: picture, capacity thread, dimensions and prices. Gits Bros. Mfg. Co.

INSTRUMENTS AND CONTROLS

144 Indicating Gages—This 4-pp brochure, describing and illustrating manufacturer's line of superbronze non-corrosive indicating gages, covers the types, ranges, construction details and recent improvements in these gages. Complete specifications given. Star Brass Mfg. Co. Div., Williams & Hussey Machine Co., Inc.

145 Industrial Crime Prevention—Titled, "Case No. 37" this 16-pp pocket-size booklet stresses the use of adequate recording and metering instruments as a prevention for the industrial crime of waste caused by shutdowns. It covers high speed meters, speed recorders and indicators, recording ohmeters, relays and other instruments and accessories, describing each in detail, telling its applications and illustrating it by photo. The Esterline Angus Co., Inc.

SAFETY, SANITATION

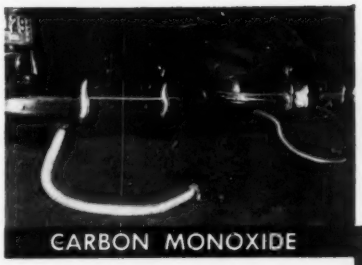
146 Washfountains—Four-pp Folder K-711 illustrates installations of a "duo-washfountain" designed for use by two persons. Stresses savings in money, space and plumbing afforded by their use instead of single-person units in smaller plants where number of persons to be served doesn't warrant installation of manufacturer's large washfountains. Modern design and foot control are also featured. Roughing-in dimensions and diagrams indicate size. Mixing valve, foot-control, sprayhead and self-flushing bowl are described. Bradley Washfountain Co.

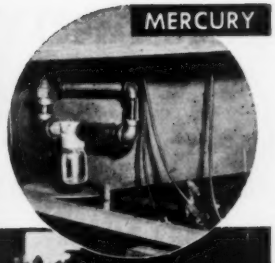
147 Oxygen Unit—Plant engineers will be interested in the new oxygen therapy unit for administering oxygen on a demand-regulated basis which is described in Bulletin CW-3, 2 pp. With this unit the patient's safety is always assured, the bulletin states, because the oxygen flow automatically adjusts to individual breathing needs. Bulletin recommends this lightweight unit for dispensaries, plant hospitals and first-aid rooms for treatment of gas poisoning, heart failure and other conditions where oxygen treatment is indicated. Describes operating principle, range of applications. Mine Safety Appliances Co.

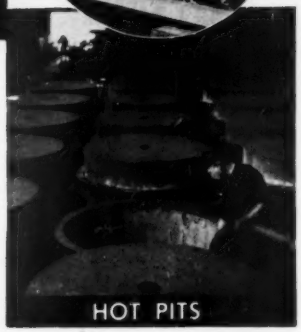
148 Fire Extinguishers—How a new tinning process doubles the life of manufacturer's fire extinguishers by protecting metal from corrosive action is explained in 2-pp illustrated Bulletin AD11004. Also discusses the construction and operation of these extinguishers. American-LaFrance-Foamite Corp.

FLEXIBLE COUPLINGS

149 Flexible Coupling—All metal pin-type couplings described as flexible in all directions are illustrated, described in detail and listed with sizes and size-selection instructions in 4-pp Bulletin 51. Discusses heavy and light service applications for these couplings, boring and keyseating practices. Many sketches illustrating design features are included. Smith & Serrell, Inc.







HANDLING *fumes, liquids and hot materials* WITH SPENCER VACUUM

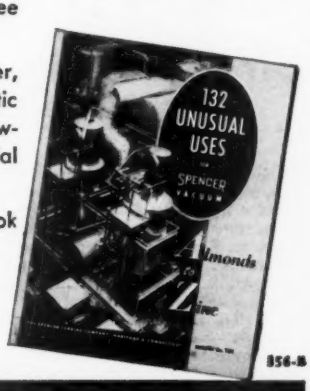
Spencer Vacuum is not new to industry, but more than 100 unusual applications in industry have been used for the first time during the past few years.

This impetus came with the surge of war production, requiring that everything be done well and quickly, and that the heretofore impossible be done immediately.

No man can work in a hot pit, pick up globules of mercury with a spoon, or chase carbon monoxide gas out of a garage with a fan. Yet Spencer Vacuum does all three jobs almost automatically.

Spencer provides the vacuum power, the special hose and tools, automatic dumping mechanisms, and the know-how based on hundreds of special applications.

All you have to do is send for the book of "132 Unusual Uses" and use your ingenuity and imagination to discover a highly valuable application for your plant.



856-B

SPENCER HARTFORD VACUUM CLEANING

THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.

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COOLS
WATER
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OIL
through rapid heat transfer

The exceptionally high capacity of the new Temprite Industrial liquid cooler is the result of rapid heat transfer, made possible with the famous Temprite "flooded" cooling principle. A complete system may be installed to cool water, light oils, alcohol and certain chemicals, without the necessity of employing space-consuming storage tanks. For example, the compact 54"-high Temprite will deliver 1185 gallons per hour, reducing the temperature from 60° to 40°. Details on request.

SINCE 1929
Temprite
Products Corp. 55 Piquette, Detroit 2

150 Flexible Coupling Data — Four-pp Bulletin 87 describes and illustrates two styles of flexible couplings, giving complete specifications, dimensions and list prices. Text tells applications for each type. One page of pictures shows these couplings in use. W. A. Jones Foundry & Machine Co.

LIGHTING

151 Guide to Plant Lighting—Bulletin FP in 32 pp presents a solution to practically all lighting problems from fixtures for fluorescent general lighting for large areas and high mounting to local lighting of spray booths, giving recommendations and equipment specifications and including photos. A well-organized handbook, this clearly written bulletin also tells how production problems may be solved by better lighting and how to get more efficiency out of a plant's present lighting. Benjamin Electric Mfg. Co.

152 Lighting Catalog—This is an excellent collection of bulletins and data sheets covering fluorescent lighting for commercial and industrial applications. Gives specifications, construction features and dimensions on many types of fixtures, as well as other necessary engineering data for selecting proper equipment to serve specific industrial lighting needs. Also includes current price list. Ender Mfg. Corp.

MISCELLANEOUS

153 Plant Maintenance Show — Four-pp folder in color on the First Plant Maintenance exhibit and conference to be held in Cleveland Auditorium Jan 16-19, 1950. Bulletin covers: purpose of show; importance of cost cutting techniques; details of exhibits; show hours; technical sessions; hotel accommodations and general information. Admission by ticket only; free tickets issued upon request. Clapp & Poliak.

154 Pilot Plant Filter—Illustrated Bulletin 158, 4 pp, announces a new pilot-plant rotary vacuum filter with string discharge, giving its specifications and explaining manufacturer's rental-purchase plan by which one of these filters may be tried without capital investment. Shows the basic principle of operation of the rotary vacuum filters and cites performance records of several installations. Filtration Engineers Inc.

155 Twin Strainers—Bulletin A-13, 12 pp, describes two basic types of twin strainers for continuous service in clearing liquids, featuring the newer of these types. Explains and illustrates, by photos, the component parts of these strainers and provides maintenance tips. Includes specifications, dimensional data, graph showing pressure drop. Elliott Co.

156 Industrial Equipment — This interesting 36-pp pocket-size booklet titled, "What We Make," will give plant engineers a quick view of manufacturer's extensive line of processing and handling equipment, chains and transmission machinery. Not an ordering catalog, it's filled with photos and covers chains, sprocket wheels, feeders, vibrating screens, crushers, conveyors, power house equipment, ventilating fans, malleable castings and other types of equipment. The Jeffrey Co.

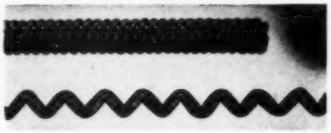
157 Water Treating Method — Bulletin 1825, 28pp, is a comprehensive story about a modern concept in water treating. From the story-telling full-color cover to the bibliography this bulletin tells of the development of manufacturer's water treating plant, and explains its principle, distinguishing characteristics, advantage, design considerations, operation, and applications. There's also further information including flow diagrams for typical installation photographs. Infilco Inc.

158 Emulsion Cleaner—Here's a bulletin comprised of 7 pp of data on a ready-to-use chemical emulsion cleaner which can be poured directly into the washer to convert water into an effective emulsion phase detergent for washing machines, wipe down maintenance cleaning, rust control in rinse stages of washers, and for pre-wetting before alkaline of flush cleaning. Material includes general data on the cleaner, comparative costs from plant test runs, case histories showing results obtained by use of the cleaner. Also recom-

ELIMINATE HAZARDS

OF TRIPPING, TANGLING STRAIGHT CORDS...

USE NEAT, OUT-of-the-WAY
Koiled Kords



One foot of neat Koiled Kord extends to approximately five feet, then retracts to its original length. Koiled Kords eliminate all the hazards of dangling straight cords on any electrical equipment that moves. They are safe, convenient and economical. Koiled Kords come in standard lengths of tire-tread neoprene-jacketed power cord or can be made to specifications.

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Neoprene-Jacketed Flexible Cords
Where the retractile qualities of Koiled Kords are unnecessary, use DYNAPRENE Flexible Cords. They resist abrasion, acids, grease and light and last far longer than rubber-jacketed cords yet the price is only slightly higher.

Be sure to specify type SO or SJO for your flexible cord requirements.

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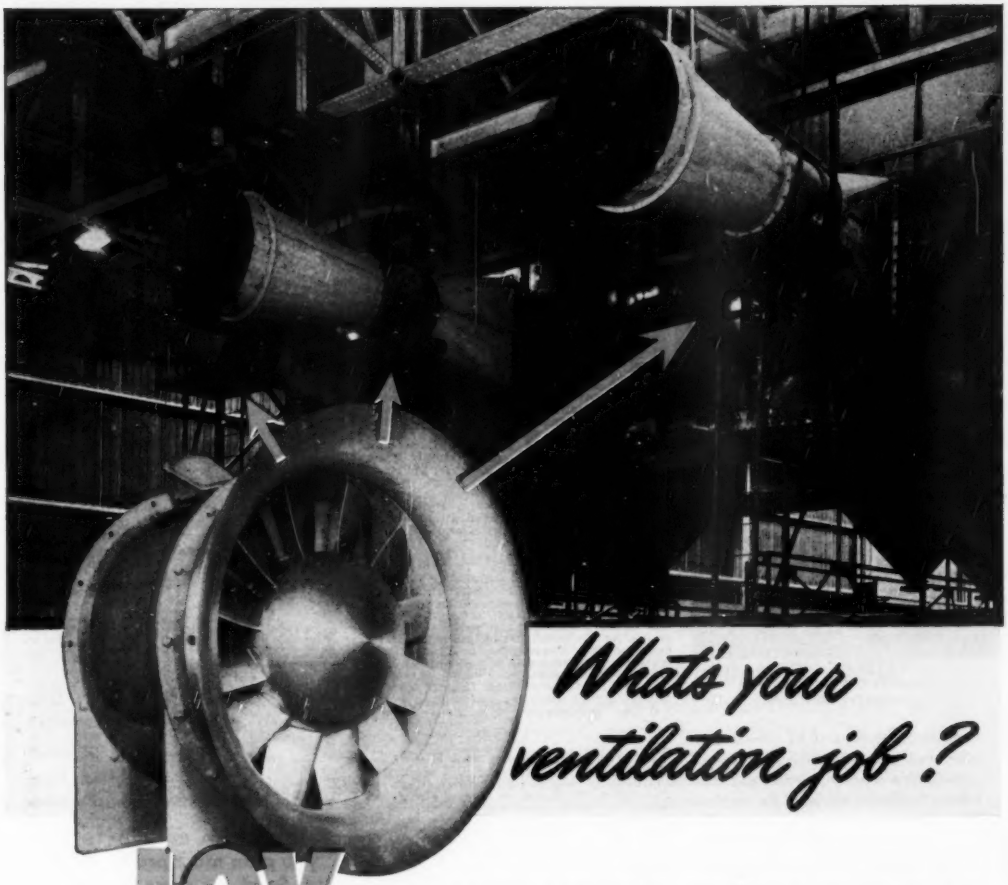

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WILL DO IT MORE EFFICIENTLY AND MORE ECONOMICALLY!

Write for Bulletin, or *Consult a Joy Engineer*

From every possible angle, JOY Series 1000 AXIVANE Fans will give you a better, lower-cost job. Their inline, vane-axial design is lighter and more compact; and they operate more quietly, require less power and space, and save greatly on installation time and costs. What's more, you get the extra flexibility of adjustable blades—an *exclusive* JOY feature—permitting easy and quick on-the-job regulation of pressure or volume over a wide operating range, with positive protection against motor over-load. ● Whatever your job is, JOY AXIVANE Fans can show you advantages—let us work with you.

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DUST IS DOLLARS

A typical Sly Dust Filter—heart of the complete dust control system.

In many industries, such as cement and other rock products, milling of grains, manufacture of soap powders and cosmetics, the finer particles of the product are *valuable*. By collecting this dust Sly Filters are saving thousands of dollars.

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Inexpensive, Sly Filters draw the dust-laden air from the source and remove all dust by filtration through cloth. They offer many advantages in saving of space, power, and by economies effected in operation. They soon repay their cost and add to net income.

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This 24-page booklet tells about dust control and what it can mean to you. It is called Bulletin 98. Send for a copy and tell us about your dust problem so that we can write you fully.

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mends concentrations, discusses applications. The Du Bois Co.

159 Reference Bibliography for Water, Sewage and Power Plant Engineering—This 36 pp, letter size, paper bound bulletin consists of a comprehensive and up-to-date listing of the best available sources of information on use of water for drinking and also for boiler feedwater supply, on sewage treatment and industrial waste treatment, and on power plant design and operation. The bibliography lists first a number of books and magazines covering water supply, treatment, treatment plant design and operation. Next, publications on the bacteriology of water and sewage. Third, publications covering sewage and industrial waste treatment and chemistry and analysis of water and sewage. Fourth, publications on power station design, operation and equipment and finally standard engineering handbooks, data and aid for hydraulic and power engineering. A list of foreign publications is also given. Also a list of periodicals on chemical laboratory procedure, water and sewage, and a good list of manufacturers publications, many of which may be obtained free. Published by Gilbert Associates, Inc.

160 Cool Crane Cabs—Bulletin 1300 discusses, in 12 pp, the necessity of air conditioning systems for crane cabs operating in hot or contaminated atmospheres. It sets forth in detail the various requirements for air conditioning crane cabs and explains the mechanical and functional features of manufacturer's crane cab cooling equipment. Specification data sheets are included for three models. Illustrated with photos, layout diagrams and tabular material on temperature conditions. Dravo Corp.

161 Protective Masking—The ease of application and removal and the protection afforded by a self-sticking masking are illustrated by photos in pocket-size Form 2008, 6 pp. Also covers other advantages of the masking, tells some of its uses and shows how it is applied. Mystic Adhesive Products.

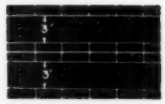
162 Alloys For Corrosion Prevention—Six-pp Bulletin T-171, on solving corrosion problems with high-alloy castings, features two important charts to help in selecting the right alloy for most corrosive conditions. A "quick selector" shows the comparative corrosion resistance of the most commonly used gades in 179 different corrosive media. Also includes a list of standard corrosion-resistant alloys with their nominal composition, mechanical properties. American Brake Shoe Co.

163 Steel Castings—The long-run economy and other advantages of steel castings are discussed briefly in this 36-pp book, which also touches upon the history of casting metals and the research which has contributed to their development. Book is filled with photographs of castings used in many industries—construction, refineries, rolling mills and blast furnaces, metal working power plants, electrical equipment. An envelope folder attached to book contains a tabulation of the general engineering types of steel castings, classified according to tensile strength. Steel Founders Society of America.

164 Furnace Wall and Arch Construction—This 28-pp illustrated booklet presents manufacturer's suspended arches and sectionally supported walls and their application to all types of furnace enclosures. Photos and drawings show the use of these steel arches in open hearth furnaces, mill furnaces, annealing furnaces, incinerators, dehydrators, down draft and upshot heaters, boilers. Photos also show construction and exterior finish of supported walls. Includes dimensions of standard arches and charts showing heat loss from manufacturer's heavy-duty "duo-seal" walls and from "duo-seal" thin walls. Laclede-Christy Clay Products Co.

FIGURE IT YOURSELF!

Rotabins reduce storage space



Conventional Floor Layout:

⅓ sq. ft. for storage and 1 sq. ft. for aisles

Rotabin Floor Layout:

2 sq. ft. for storage and 1 sq. ft. for aisles

Rotabins also save time . . .

. . . less time walking
. . . less time looking
. . . less breakage
. . . . less loss

Let F-G-M engineers help you plan most profitable layout. Send for copy of Catalog 106-A to:

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SHELVING • PARTS BINS • ROTABINS
COUNTERS • RACKS • TABLES

New Products and Methods

(Continued from page 26)

43—RENEWABLE FUSES

Cartridge type, for protection where time delay is most needed

In announcing this line of time delay fuses, manufacturer points out that most electric circuit "blows" occur on overload operations, and it is the purpose of these fuses to give improved protection within the 135 and 200 per cent range.

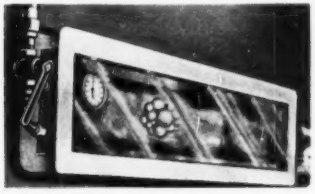
These renewable fuses can be quickly disassembled to insert new links, according to manufacturer. The knife-blade type is designed to maintain alignment of blades under all conditions, and the ferrule type is designed for easy accessibility. Both types are available in 250 and 600 v, and in 1 to 600 amp. Economy Fuse & Mfg. Co.

44—PIPING LEAK DETECTOR

For quickly locating leaks in pipes, tanks, storage vessels

The American Vacuum Seam Tester, a compact, portable unit, can often eliminate the necessity of taking out of service the old equipment to be tested. In the construction of new tanks and storage vessels, it is said to detect even the smallest unsuspected pin-point leaks.

Tester operates on a simple, vacuum principle. Seams are covered with soap suds. Inspection box, with clear glass top



and soft rubber base is laid over seam. A powerful vacuum created within the inspection box draws air through any leaks causing soap bubbles to form. These are clearly visible through the glass top. Testers are available in a wide variety of sizes and shapes for inside corners, outside corners, circumferential seams and straight seams. American Pipe & Steel Corp.

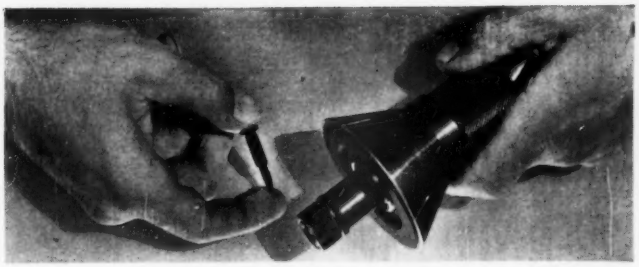
45—CONCRETE FLOAT

For semi-finishing concrete and mastic floors, walks, driveways

These vibrating units are advantageous in the floating of extra low moisture content concrete as the vibration is intended to eliminate hand floating dry concrete and greatly speed up the process. The units are made up of a small 15-lb pulsating electro

magnet vibrator mounted on a 24 by 30 in steel float, a three section 7½ ft tubular handle adjustable up or down to various heights, and a 35 ft three-conductor grounded cable. Operates on 110 v, a-c lighting current circuit.

The intensity of the vibration at the float can be varied by a dial switch in the controller, permitting operator to handle concrete of different degrees of moisture and to reduce vibration gradually as the work is accomplished. In some cases, the vibrating float is used, not only



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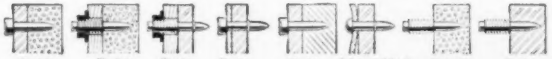

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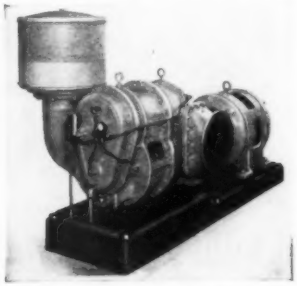
to produce a finish, but also to spread and level the concrete as poured. The float with sectional handle, grounded cable and controller are shipped in a compact, sturdy carrying case that can be used for transporting and storing the unit. Syntron Co.

46—AXIAL-FLOW BLOWER

Positive displacement type, has many industrial applications

The Standardaire Blower is available in capacities from 100 to 15,000 cfm and for pressures up to 20 lb. Features claimed for it are quietness of operation, compact-



ness and reduced weight—the 2000 cfm blower weighs approximately 1000 lb. Because it may be operated at high speeds the blower lends itself to direct drive by standard motors. The Standard Stoker Co., Inc.

47—GAGE ILLUMINATORS

Solid-wedge type, are made to show liquid level clearly

The new Solid-Wedge Type Gage Illuminators are designed to give evenly diffused light over the entire length of the gage glass with no glare spots or blinding areas, and to enable the engineer to see liquid level easily and clearly under all conditions. Liquid level can be read easily at much greater distance with this new illuminator, it is said, because the illumination from a single light source is reflected from an angular surface and flows with evenly diffused intensity through the transparent gage glass.

These illuminators are made in both explosion-proof and standard models for all sizes of transparent gages, and in both single and double section styles. Lighting is by a standard small bulb, only one bulb being necessary to illuminate two gage sections with the double section illuminator.

The explosion-proof light unit is built in accordance with Underwriters' Laboratories standards for use in hazardous locations for Class I, Group D Services. Illuminators have aluminum brackets for mounting on the top two cover bolts of the gage section. Jerguson Gage & Valve Co.

48—PRESSURE GAGE

In smaller size, has 3½ in. dial and external pointer adjuster

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and hydraulic presses up to 10,000 psi. It has the same features as manufacturer's larger gages, including the same movement, stainless steel bearings, fused joints. Helicoid Gage Div., American Chain & Cable Co., Inc.

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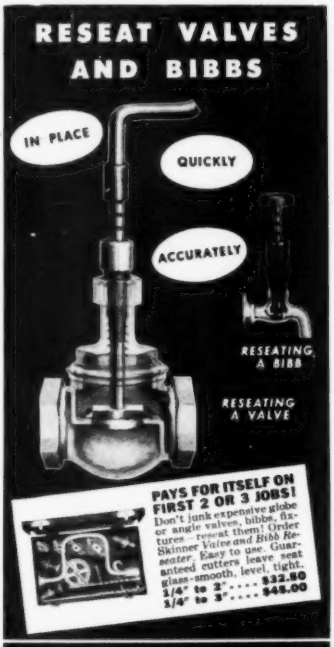

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New Books for Plant Engineers

An asterisk (*) following the title of any book described in this department indicates that the book may be purchased from the Book Department, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill.

How to Correct Power Factor*

POWER CAPACITORS by R. E. Marbury. Size 6 by 9 in.; 201 pp plus index; first edition; cloth bound. Published by McGraw-Hill Book Co. Price $3.50.

DEVOTED TO the use of capacitors on power circuits, this booklet gives the industrial plant engineer an understanding of the significance of power factor, the gains to be made through the use of capacitors and their rating, design, and manufacture. It also covers fuses, switches, and connections used with capacitors, automatic control of capacitor KVAR and illustrations of applications to specific industrial loads. The last chapter deals with capacitor installation and maintenance.

Engineer's Registration Practice

PROFESSIONAL REGISTRATION LAWS AND THE ENGINEER. Size 5½ by 8½ in. 57 pp plus index. Published by A. M. Sargent, 19669 John R Street, Detroit 3, Mich. Price $0.75.

FOR THOSE engineers interested in the professional engineering licensing laws this book will be of interest. Such laws have been enacted in each of the 48 states, and territories. The booklet points out the advantages of registration and goes into detail in pointing out the inconsistencies in the application and administration of these laws as set up between the various states.

Tested Structural Details*

MODERN INDUSTRIAL CONSTRUCTION — A DETAIL REFERENCE, by Duane F. Roycraft. Size 9¾ in. by 11¼ in.; 212 full-page detail plates plus index; flexible imitation leather cover. Published by Roycraft Publishing Co. Price $10.00.

IN THE PREFACE to this volume, the author, an architect specializing in industrial buildings, states that while material symbolical of good construction is available for the residential and commercial class of structure, no edition at this time specifically treats shop or factory construction in detail form.

The 212 detail plates presented in loose-leaf form are drawn to scale, ranging from ⅛ in. to the foot to full size, and may in many instances be removed and reproduced on working drawings with little or no change.

Details of particular interest to plant engineers are: door and door frames, 51 plates; stair construction, 26 plates; walls and monitors, 12 plates; and such other details as expansion joints; flashing, hatch covers, ladders, louvers, roofs, bins, hangers, showers, etc.

Text is limited to a preface explaining the book, a complete index and table of abbreviations. Plates are printed on one side only and T-slotted for removal and replacement.

Budget and Cost Controls

NEW CONTROLS FOR FIXED AND VARIABLE COSTS. Size 6 by 9 in.; 39 pp; paper bound. Published as Production Series Booklet, No. 178 by the American Management Assn., 330 West 42nd Street, New York, N. Y. Price $0.75.

WHILE THIS booklet is concerned with production costs it has much of general information on the application and necessity for proper accounting practice and cost controls in industrial plants, a large proportion of which is equally applicable to production or maintenance practice. The booklet is made up of four papers presented at an A.M.A. meeting. The titles are: Organizing for Efficient Production and Effective Cost Control; Production Control as a Cost Reduction Tool; The Cost Reduction Program at Republic Steel; and, A Flexible for Overhead Factory Expense.

Conveyors for Material Handling*

CONVEYORS AND RELATED EQUIPMENT, by Wilbur G. Hudson. 6 in. by 9 in.; 450 pp plus 18 pp of appendices and index; Second Edition; 1949. Published by John Wiley & Sons; Price $7.00.

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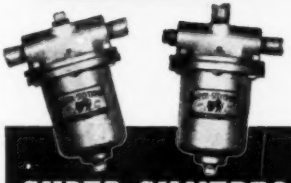

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(Continued on page 72)

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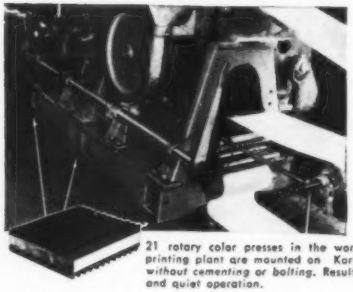

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(Continued from page 70)

trusses, factory construction, bridge and trestle, warehouse, tower and hanger design. Practically everything that will be encountered in the usual industrial design practice is included. In general the plates show detailed drawings, photographs of typical designs and a bill of material.

Why Do We Have Standards?

WHAT GOOD ARE STANDARDS. Size 8½ by 11½ in.; 47 pp; paper bound. Published by the American Standards Association, 70 East 45th Street, New York 17, N. Y. Price $1.00

AN ASSEMBLY of papers from the 30th Annual Meeting of the Association, outlining the various advantages of standardization. These papers cover the legal standpoint, as well as standardization from the viewpoint of the armed services, engineering purchasing and production, the wholesaler, retailer, and consumer.

How to Use Statistics*

PRACTICAL BUSINESS STATISTICS, by Frederick E. Croxton and Dudley J. Cowden. Size 6 by 9 in., second edition; 488 pp plus index and 16 appendices totalling 50 pp; cloth bound. Published by Prentice-Hall, Inc. Price $6.35.

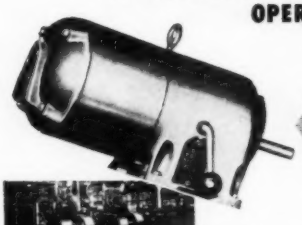
A GOOD PART of an engineer's work deals with the collection, evaluation and presentation of data but most engineers have only a passing knowledge of the new science of statistics which of recent years has become of increased importance and highly specialized.

While this book does not deal with engineering statistics, it is, contrary to most texts on this subject, highly readable and covers the subject well in a practical way. The 22 chapters are divided into two groups, the first 16 covering an elementary course in statistics, the balance being more advanced or specialized. Material considered technical is printed in small type and may be skipped without affecting the continuity.

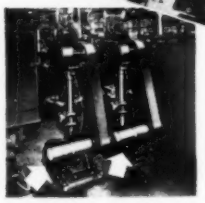
In addition to being highly readable, the data presented are actual data taken from various business concerns and Government agencies. As such, they may be considered as

(Continued on page 76)

HERE IS THE ANSWER TO INCREASING PRODUCTION WHILE LOWERING OPERATING COSTS



THE LIMA GEARSHIFT DRIVE



Above view shows Lima Drives applied to two Garvin Automatic Tappers. Photo courtesy International Harvester Company.

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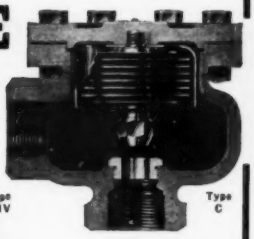

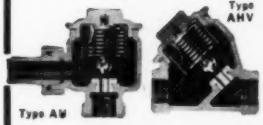

Nicholson steam traps save the time and trouble of adjusting valves for varying pressures. This feature substantially speeds maintenance and production. Made of hardened stainless steel, the valve is extra large, resulting in from 2 to 6 times average drainage capacity. Both valve and seat are renewable. The fast action of Nicholson traps prevents waterlogging. Installations have increased production of cooking kettles, for example, as much as 30%. Widely specified for preventing damage to thin gauges. Eliminate "cold blow" in unit heaters. 5 types for every application. Size ¼" to 2"; press. to 225 lbs.

BULLETIN 1047 or see Sweet's

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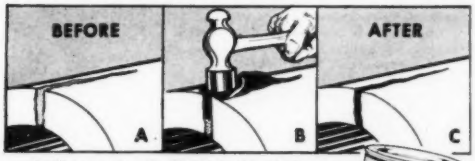

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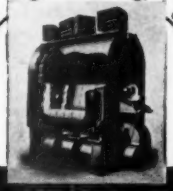
FOLLOW THE HEAT OF YOUR BUILDING



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- No licensed fireman
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STOP THE DUST HOG from stealing profits with

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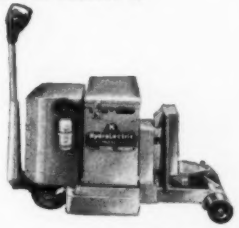
Hitch this efficient "Power Package" ...to practically any load!

Motorize your movable equipment with this trouble-free Stuebing-Engineered Prime-mover!

If you have castered or other movable equipment which presents a moving problem, investigate the Stuebing "Power Package." The complete power unit from the famous Hydro-Lectric Model "K" Lift Truck, the "Power Package" includes twin wheel drive, heavy duty motor, and fool-proof fingertip controls of two speeds forward, two in reverse and dynamic brake. In effect, the "Power Package" is like an outboard motor . . . adaptable to a wide variety of moving jobs. Capacity is rated at 200-500 pound draw bar pull.

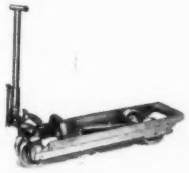
Stuebing engineers will gladly show you, at no charge, of course, how the "Power Package" can be adapted to your moving problems.

For complete specifications write for Bulletin S.



Hydro*Lectric* KTL—new tractor for semi-live skids. Includes the Stuebing "Power Package," two speeds forward, two in reverse and dynamic brake.

Hand Lift Trucks — both single and multi-stroke; all parts machine fitted with machine bolted construction.



LIFT TRUCKS INCORPORATED

2425 SPRING GROVE AVE. • CINCINNATI 14, OHIO

(Continued from page 72)

case studies on the use, interpretation and presentation of data encountered in business and engineering applications.

The various appendices cover references in almost every field, practical calculation aids, and mathematical tables of wide general application.

Treatment of Industrial Waste

TREATMENT AND DISPOSAL OF INDUSTRIAL WASTE WATERS, by B. A. Southgate. Size 6 by 9½ in., 322 pp plus index; cloth bound. Published by H. M. Stationery Office, 429 Oxford Street, London W.1, England. Price 12s 6d. Net. (Approximately $2.50.) Obtainable through Stechert, Hafner, Inc., 31 East 10th Street, New York 3, N. Y., for $3.65 net.

DUE TO THE tightening of state legislation regarding stream polution, and particularly, since passage of recent Federal legislation, the matter of industrial waste disposal is fast becoming a matter of primary concern to plant engineers.

In Great Britain with a high population and industrial concentration, this problem has long been recognized. In 1927 a permanent organization known as the Water Polution Research Laboratory was set up. This book by the Director is largely a summary of their work and experience.

It is divided into 19 chapters, the first five dealing with general considerations, and the balance with specific industry such as: coal mining and carbonization; copper; pickling of steel; chromates and cyanides; textiles; laundrying; canning; paper mills; milk products; slaughter houses; breweries; and, tanneries. The last chapter covers miscellaneous processes with specific reference to: oil from engineering processes; explosives; synthetic resins; washing from tarred roads; sheep dipping; concentration of garbage; straw-board and beet sugar plants.

It is a thoroughly modern and complete text on an important subject, and is extremely practical. While written by an expert in the field as a book for engineers, it is readable and easily understood. The book is particularly valuable in that each chapter is concluded with a list of references of current publications, engineering society proceedings, and Government publications from all over the world dealing with that particular subject.

For Better Personnel *

PSYCHOLOGY OF PERSONNEL IN BUSINESS AND INDUSTRY, by Roger M. Bellows. Size 6 by 9 in.; 445 pp plus 50 pp of appendices and index; cloth bound; 1949. Published by Prentice-Hall, Inc. Price $6.00.

A THOROUGHLY practical volume based upon the author's experience of many industrial concerns and of value to those who must develop better personnel relations in their own departments.

The book is divided into five parts and twenty chapters. Following a brief introduction on the background, and need for better personnel relations, the book deals with such practical aspects as job analysis, interviews, use of psychological tests, training, job evaluation, incentives, merit systems, and turnover control. There is also a great deal of practical information on such subjects as employee counseling, communications for the dissemination of information within an organization, employee attitude surveys, and suggestion systems. About the least valuable part of the book is a very complete list of references, dealing with specific topics, which may be pursued by those seeking further details on specific subjects.

Handy With Tools? *

COMPLETE HOME HANDYMAN'S GUIDE, by Hubbard Cobb. Size, 5½ in. by 8¼ in., 493 pp plus index; illustrated, cloth bound. Published by Wm. H. Wise & Co., Inc. Price $3.98.

SPECIFIC instructions are given for everything the handyman may want to do, from a few lines on how to drive a nail to a 36 pp section on remodeling the basement. The book contains more than 1,000 illustrations—perspective drawings, elevations, sections, details, and diagrams—which thoroughly clarify the text. The last section includes useful information on weights and measures, temperature, geometric formulas, mixing paints, standard lumber sizes, a glossary of terms and table of abbreviations.

Although written primarily for the handyman, the book includes many suggestions of practical use in plant maintenance.

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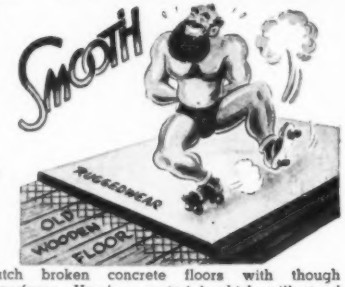
FOR BROKEN Concrete or Wood Floors

Makes Durable Patch or Complete Overlay



Resurface or patch broken concrete floors with though RUGGEDWEAR resurfacer. Here's a material which will stand up under the most punishing traffic conditions. Simple to install—no chopping or chipping required. Merely sweep out the spot to be repaired—mix the material—trowel it on. Holds solid and tight right up to irregular edge of old concrete. Provides a firmer, tougher, smoother, more rugged wearing surface. Used indoors or out. Dries fast.

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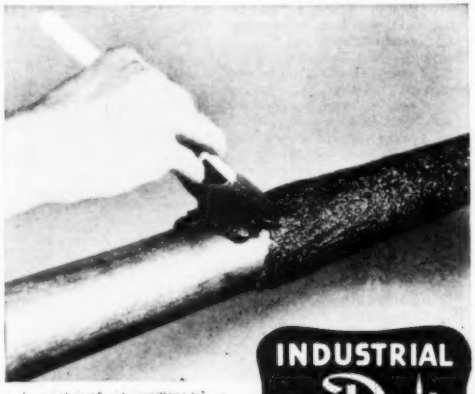

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THIS 3 SECTION DUST CONTROL SYSTEM ...provides 3 distinct advantages

1. Economical night shift operation
2. Higher collecting efficiency
3. Flexibility

This installation in the buffing and polishing department of this well-known nameplate manufacturer illustrates the way in which KIRK & BLUM engineers are able to design, fabricate and install the equipment to meet your individual requirements.

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Dust control for 36 buffing and polishing machines was divided between the three systems. One of the systems serves the machines used on the night shift alone . . . thus avoiding the excessive cost of operating the complete system. In addition, multiple collectors provide higher collecting efficiency . . . the relocation of one line would not curtail the operation of the other two.

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Use AMERICAN MONORAIL Overhead Handling Systems

Spur track from crane unloads coil to storage yard.
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Outside spur handles die blocks from truck to shop.
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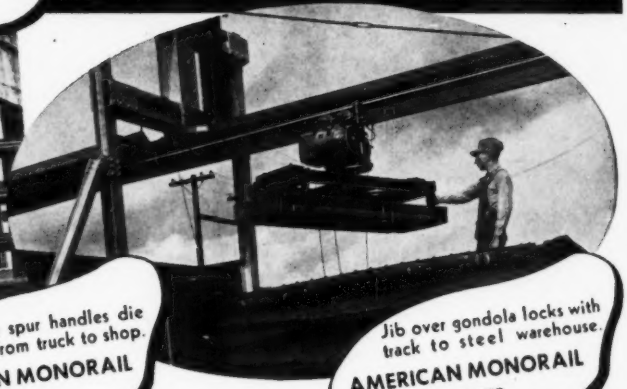

Jib over gondola locks with track to steel warehouse.
AMERICAN MONORAIL SAVES

THE AMERICAN MONORAIL COMPANY

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